GASTROENTEROLOGY

ABSTRACTS AND CITATIONS

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PREFACE

GASTROENTEROLOGY ABSTRACTS and CITATIONS is a publication of the National Institute of Arthritis, Metabolism and Digestive Diseases. This specialized information medium has been initiated to fill an existing great need in the field of gastroenterology and to assist the Institute in meeting its obligations to foster and support laboratory and clinical research into the nature, causes, and therapy of diseases of the gastrointestinal tract. Publication GASTROENTEROLOGY ABSTRACTS and CITATIONS makes available citations of all current papers relevant to this field from medical journals published throughout the world. Approximately one-third of the citations dealing with the major aspects of gastroenterology have accompanying abstracts.

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The Secretary of the Department of Health, Education, and Welfare has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through April 30, 1975.

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NOTE

Journal names are abbreviated according to the list of abbreviations used by *Index Medicus*. For journals not covered by *Index Medicus*, the abbreviations (with some modifications) found in *World Medical Periodicals*, 3rd Edition, are used.

LANGUAGE ABBREVIATIONS

Afr.	Afrikaans	It.	Italian
Ar.	Arabic	Jap.	Japanese
Bul.	Bulgarian	Kor.	Korean
Ch.	Chinese	Latv.	Latvian
Cz.	Czech	Lith.	Lithuanian
Dan.	Danish	Nor.	Norwegian
Dut.	Dutch	Pol.	Polish
E.	English	Por.	Portuguese
Eston.	Estonian	Rum.	Rumanian
Fin.	Finnish	Rus.	Russian
Fl.	Flemish	Ser.	Serbo-Croatian
Fr.	French	Sl.	Slovak
Ger.	German	Sp.	Spanish
Gr.	Greek	Sw.	Swedish
Heb.	Hebrew	Th.	Thai
Hun.	Hungarian	Turk.	Turkish
Ic.	Icelandic	Uk.	Ukrainian
In.	Indonesian	Viet.	Vietnamese

ABBREVIATIONS USED IN ABSTRACTS

ACTH	adrenocorticotropic hormone	mm	millimeter(s)
ADP	adenosine diphosphate	mOsm	milliosmolar; milliosmeter(s)
AMP	adenosine monophosphate	msec	millisecond(s)
amp	ampere	mV	millivolt(s)
ATP	adenosine triphosphate	min	minute(s)
Å	angstrom	MTD	maximum tolerated dose
BSP	sulfobromophthalein	NAD	nicotanamide adenine dinucleotide
C	degrees centigrade	NADH	reduced nicotanamide adenine dinucleotide
cal	calories	NADP	nicotanamide adenine dinucleotidephosphate
cc	cubic centimeter	NADPH	reduced nicotanamide adenine dinucleotidephosphate
cm	centimeter(s)	ng	nanogram (10^{-9})
dl	deciliter	nm	nanometer(s)
DNA	deoxyribonucleic acid	Pa	ambient pressure
ED_{50}	median effective dose(s)	PAS	periodic acid — Schiff
EDTA	ethylenediamine tetraacetic acid	pg	picogram (10^{-12})
e.g.	for example	pgEq	picogram equivalent(s)
EEG	electroencephalogram	p.o.	orally
ESR	erythrocyte sedimentation rate	ppb	parts per billion
g	gram(s)	ppm	parts per million
µg	microgram(s)	r	Roentgen
Hz	Herz	RBC	red blood cells (erythrocytes), red blood count
hr	hour(s)	resp.	respectively
i.m.	intramuscular	RNA	ribonucleic acid
i.p.	intraperitoneal	s.c.	subcutaneous
IU	international unit(s)	sec	second(s)
i.v.	intravenous	SGOT	serum glutamic-oxalacetic transaminase
kcal	kilocalorie(s)	SGPT	serum glutamic-pyruvic transaminase
kg	kilogram(s)	U	unit(s)
K_m	Michaelis constant	UV	ultraviolet
LD_{50}	median lethal dose(s)	V	volt
LDH	lactic acid dehydrogenase	WBC	white blood cells (leukocytes), white blood count
m	meter(s)	yr	year(s)
M	molar; mole(s)		
mM	millimolar; millimole(s)		
µM	micromolar; micromole(s)		
ma	milliampere(s)		
mCi, µCi	milli-, microcurie(s)		
mEq	milliequivalent(s)		
mg	milligram(s)		
ml, µl	milli-, microliter(s)		

PRE-CLINICAL SCIENCES

MORPHOLOGY, CELLULAR STRUCTURE AND HISTOCHEMISTRY

8003 STUDIES OF INTESTINAL LYMPHOID TISSUE. I. ELECTRON MICROSCOPIC EVIDENCE OF 'BLAST FORMATION' IN EPITHELIAL LYMPHOCYTES OF MOUSE SMALL INTESTINAL MUCOSA. *(E.)* Marsh, M. N. (Southampton Univ. Sch. Med., England). *Gut* 16(9):665-674, 1975.

The morphology of epithelial lymphocytes was studied by light and electron microscopy in osmium-fixed, Epon-embedded jejunum from adult male Charles River mice. Thick (1 nm) plastic sections, stained with toluidine blue, were compared with adjacent thin sections, permitting precise ultrastructural identification and description of selected epithelial lymphocytes. The epithelial lymphocytes varied considerably in size and shape, the majority measuring about 5-9 μm in diameter. In addition, about 5% of the lymphocytes were greater than 10 μm in diameter and were considered to be immunoblasts, while the remaining 5% were typical small lymphocytes (less than 5.5 μm in diameter) with round, heterochromatic nuclei and scanty cytoplasm. The medium-sized lymphocytes were characterized by multiple, deep-staining lysosomes, extensive Golgi apparatus, prominent centrioles, and abundant ribosomes. Mitochondria were larger and more abundant in medium-sized than in small lymphocytes; most cells contained scattered rough endoplasmic reticulum. The nuclei of the medium-sized cells were circular or fusiform, with prominent, often multiple, nucleoli, variable amounts of heterochromatin, and more euchromatin than the small lymphocytes. Immunoblasts contained large, euchromatic nuclei, and their cytoplasm was generally lightly or only moderately stained. Immunoblasts were packed with clusters of ribosomes with very little rough endoplasmic reticulum. The mitochondria were normal or markedly enlarged and the nuclei contained very large nucleoli with only scanty heterochromatin. The data indicate that lymphocyte transformation occurs within the interepithelial cell spaces of the small intestinal mucosa and suggest that epithelial lymphocytes are immunocompetent cells which may be responsive to local antigenic stimulation.

8004 SCANNING ELECTRON MICROSCOPY OF THE RAT LIVER. STUDIES OF THE EFFECT OF TAUROLITHOCHOLATE AND OTHER MODELS OF CHOLESTASIS. *(E.)* Layden, T. J.; Schwarz, J.; Boyer, J. L. (Dept. Medicine, Univ. Chicago, Chicago, Ill.). *Gastroenterology* 69(3):724-738, 1975.

Scanning electron microscopy was used to evaluate the normal surface anatomy of rat (male and female Sprague-Dawley strain) sinusoids, hepatocytes, and canalicular lumen, and to assess changes in the surface morphology of the bile canaliculus following bile duct ligation, ethynyl estradiol administration (0.5 mg/day for 5 days, i.p.), or the administration of sodium taurolithocholate, sodium taurocholate, and/or lithocholate sulfate (0.6-0.8 μM/0.16 ml/min). Sodium taurolithocholate-induced cholestasis was associated with specific dilation and disruption of the canalicular membranes; these changes corresponded to the evaginations of the pericanalicular ectoplasm observed by transmission electron microscopy. Lithocholate sulfate and sodium taurocholate prevented the occurrence of these severe abnormalities. Bile duct ligation produced progressive canalicular dilation (from 1 to 96 hr) and loss of microvilli, but did not result in the type of membrane changes produced by sodium taurolithocholate. No significant changes in canalicular morphology were observed following ethynyl estradiol treatment. The data demonstrate the value of scanning electron microscopy in the evaluation of both normal and abnormal hepatic surface morphology. They also indicate that sodium taurolithocholate produces a distinctive abnormality in the structure of the canalicular membrane, probably as the result of a direct toxic effect on the membrane structure; this abnormality is not seen in other models of cholestasis.

8005 SCANNING ELECTRON MICROSCOPY OF PROLIFERATING BILE DUCTULES. *(E.)* Brooks, S. E. H.; Reynolds, P.; Audretsch, J. J.; Haggis, G. (Dept. Pathology, Univ. West Indies, Kingston 7, Jamaica). *Lab. Invest.* 33(3):311-315, 1975.

Bile duct ligation was performed on 75 male Sprague-Dawley rats in order to induce bile ductular proliferation. The animals were sacrificed one day to six weeks later and the effects of the ligation were examined by scanning electron microscopy (SEM). After perfusion fixation with glutaraldehyde and ethanol dehydration, blocks of liver were frozen in liquid nitrogen, fractured, and returned to ethanol prior to critical point drying. Ligation of the common bile duct provoked a rapid proliferation of intrahepatic bile ductules, which was obvious by day three, and was accompanied by focal necrosis, acute inflammation, and mitotic activity, predominantly in hepatocytes but also evident in ductal cells. Reticulin developed around the bile ductules. The proliferating bile ductules and preductules were surrounded by collagen and arranged longitudinally. The luminal surfaces of the ductules contained many microvilli. Canalicular distention was also visible three days after ligation and was accompanied by blunting of the microvilli. Freezing the tissue in 100% ethanol prevented the formation of ice-crystal artifact. Thus, the canalicular distension seen was a result of ligation and not a preparative artifact. Uniform "cables" (190 nm in width) were observed in the lumen. Transmission electron microscopy indicated that the cables had the structure of cilia. Occasionally, spheroid structures, which may have represented bile components precipitated by fixation, were seen in the lumen of the ductules. Sinusoids were not prominent in the areas of the liver that were crowded with proliferating ducts. It is concluded that this SEM technique has created a new approach to the study of liver morphology. These approaches may be useful in the study of human cholestasis and obstructive jaundice.

8006 A MORPHOMETRIC STUDY OF NORMAL HUMAN LIVER CELL NUCLEI. *(E.)* Ranek, L.; Keiding, N.; Jensen, S. T. (Medical Dept. A, Rigshospitalet, Copenhagen, Denmark). *Acta Pathol. Microbiol. Scand.* [A] 83(5):467-476, 1975.

The nuclear size, variation in size, and prevalence of polyploid and binuclear liver cells were estimated in liver needle biopsies from 12 patients with normal livers. Liver cell nuclear size was estimated in the fasting biopsy samples by the projection method. The distributions of the lengths of the nuclear radii were consistent with normal distributions corresponding to the different ploidy classes. Diploid nuclei constituted 84 to 99% of the liver cell nuclei; the frequency of polyploid nuclei increased with increasing age. Samples of nuclei within the same biopsy revealed significant differences in the mean radius of the diploid nuclei and in the frequency of polyploid nuclei. One of the two patients with acromegaly had a higher frequency of polyploid nuclei than was seen in the other subjects, and in both patients with acromegaly the size of the diploid nuclei was larger than in the other subjects. The frequency of binuclear nuclei was unrelated to age and frequency of polyploid nuclei, but males were found to have more binuclear liver cells than females. The projection method was found to be precise and reproducible with no significant optical distortion. The nuclear volume was found to increase with increasing length of fixation, however. The data support the concept that the nuclei of different ploidy classes form nuclear classes and that the nuclear radii form normal distributions. The data also indicate that the biological variation in nuclear size and frequency of polyploid nuclei within the same biopsy should be taken into account when karyometric data are interpreted.

8007 ENERGY DISPERSIVE X-RAY MICROANALYSIS OF ZYMOGEN GRANULES OF MOUSE PANCREAS USING FRESH AIR DRIED TISSUE SPREAD. *(E.)* Takaya, K. (Hiroshima Univ. Sch. Med., Japan). *Arch Histol. Jpn.* 37(5):387-393, 1975.

The intracellular distribution of elements in pancreatic zymogen granules was studied in fresh air-dried mouse pancreas spreads using an energy dispersive X-ray microanalyzer attached to an electron microscope. In very thin areas of the tissue spread, zymogen granules could be clearly recognized as homogenously electron-dense round bodies about 300 nm in diameter. The limiting membranes of the granules usually could not be seen. Mitochondria appeared as rounded or elongated structures containing abundant electron-dense structures 300-600 Å and 100-200 Å in diameter; the rough endoplasmic reticulum was often seen. The nucleus was more electron-dense than the surrounding cytoplasm and contained electron-dense heterochromatin at its periphery. The zymogen granules were often surrounded by a streak of transparency attributable to shrinkage by dehydration. Electron probe microanalysis by the energy dispersive spectrometer disclosed peaks for sulfur, chlorine, potassium, and phosphorus in 3 of 5 granules examined; sulfur, chlorine, and potassium in 1 granule; and only sulfur and chlorine in the remaining granule. Analysis of 5 spots about 200 nm away from the respective zymogen granules showed no peaks for any element with the exception of one spot in which phosphorus and chlorine were detected. In contrast to the general belief that enzymes and electrolytes are excreted into the juice separately, these results suggest that the electrolyte content of the secretory granules may contribute to the pancreatic juice.

8008 ULTRASTRUCTURES OF NORMAL RECTAL MUCOSA. *(Fr.)* Marche, C.; Bocquet, L. (Service Central d' Anatomie pathologique, Hopital Bichat, 170 Bd Ney, 75877 Paris Cedex 18, France). *Ann Gastroenterol. Hepatol.* 10(4):301-314, 1974.

An examination of normal rectal mucosa was made which revealed crypts of Lieberkuhn separated by tissue composed of argyrophilic fibers and a polymorphic cellular population (fibroblasts, fibrocytes, histiocytes, plasmocytes, eosinophils, a few polynucleated neutrophils, mastocytes). In the normal rectal cells, differentiation and maturation followed a regular cellular progression leading from the bottom of the Lieberkuhn crypts up to the mucosal surface. The bottom of the crypts was found to be a zone of cellular multiplication (young and undifferentiated cells) and was also the origin of enterochromaffin cells. The only mature cells detected were endocrine cells with four different morphological characteristics, implying possibly more than one type of hormonal secretion. The median part of the crypts was essentially a differentiation-migration zone composed of "intermediary" cells, muco-secreting cells (immature calciform cells), and immature absorbing cells. Finally, the major functional zone (the top part of the crypts and the surface epithelium) contained mature calciform cells and mature absorbing cells, the junctional systems of which were complex. Ultrastructures of the normal rectum are similar to those of the small intestine and may have the same function: i.e., local adaptation, which is produced by slowing of the cellular turnover and a simplification of the absorption apparatus.

8009 NONRANDOM DISTRIBUTION OF GOBLET CELLS AROUND THE CIRCUMFERENCE OF COLONIC CRYPT. *(E.)* Goralski, A.; Sawicki, W.; Blaton, O. (Sch. Medicine, Chalubinskiego 5, 02-004 Warsaw, Poland). *Cell Tissue Res.* 160(4):551-556, 1975.

To investigate the distribution of goblet cells (GC) around colonic crypts, adult male guinea pigs were maintained on a standard laboratory diet and water for three days before being killed. The highest frequency of GC was found at the bottoms of the crypts. Maps of transverse sections of crypts were prepared from consecutive sections of the colon by means of a microscopic eye piece projector. Mature GC were identified by a slightly deformed nucleus. Transverse crypt sections (2826) from 116 crypts were analyzed. The observed mean variance of angular distance between GC was compared to the expected

mean. The comparison was verified by Student's test although the distribution of D_m^2 (variance of angular distance) differed from the normal distribution. The GC appeared around the crypt circumference in pairs, triplets and quadruplets, and were distributed in a significantly nonrandom manner. A superimposition of the distributions suggested a three dimensional arrangement. Factors controlling the distribution were concluded to be endogenous since changing the environment of the intestinal wall (by transplantation) did not apparently alter the GC density in the crypts.

8010 FINE STRUCTURE OF HEPATOCYTES FROM FASTED AND FED RATS. *(E.)* Babcock, M. B.; Cardell, R. R., Jr. (Sch. Medicine, Univ. Virginia, Charlottesville, Va. 22901). *Am. J. Anat.* 143(4): 399-438, 1975.

Hepatocytes from Sprague-Dawley rats on a controlled cycle of feeding and fasting were studied by transmission electron microscopy and by light microscopy. Quantitative chemical determinations of glycogen were made on each specimen. The animals were fasted for 30 hr before the final feeding period, and liver samples were removed from each group (6 rats) at the following specific intervals after initiation of the two-hr feeding period: 0 hr (30 hr fasted), one hr, two hr, and at two-hr intervals up to 24 hr. Hepatocytes from 30-hr fasted rats with extremely low hepatic glycogen levels were devoid of glycogen particles. Centrilobular cells showed areas of the cytoplasm rich in vesicles of smooth endoplasmic reticulum (SER) while periportal hepatocytes contained less extensive SER regions. Glycogen particles appeared next to the SER soon after the onset of feeding. Glycogen was dispersed throughout SER regions in centrilobular hepatocytes while it was dense next to SER membranes in periportal cells. Twelve hours after feeding, maximum glycogen levels were obtained as well as the lowest SER quantity. This inverse correlation occurred both during glycogen deposition and depletion; hence, SER is implicated in both glycogen deposition and degradation in rat hepatocytes.

8011 COLCHICINE-INDUCED LESIONS IN THE RAT DUODENUM. *(E.)* Dinsdale, D. (Rowett Research Inst., Greenburn Road, Bucksburn, Aberdeen AB2 9SB, Scotland). *Pathol. Eur.* 10(2):95-104, 1975.

The effects of s.c. colchicine (0.1-4.0 mg/kg) and s.c. cytosine arabinoside HCl (125-500 mg/kg) on the intestinal crypts of male Hooded Lister rats (Rowett Institute strain) were studied by light and electron microscopy. Rats were sacrificed three to six hr after drug administration, and the first 20 mm of duodenum excised. No treated rats showed signs of distress, although rats treated with 4 mg/kg colchicine became lethargic at 4-5 hr. On light microscopy, mucosal crypt lesions, absent from mature villi and consisting of rounded slightly eosinophilic bodies often surrounded by halos, appeared at 0.4 mg/kg colchicine and were maximal at 2.0 mg/kg; cytosine arabinoside HCl induced qualitatively and quantitatively similar lesions at 500 mg/kg. These lesions usually enclosed small basophilic inclusions, which were Feulgen-positive (but only slightly less after treatment with deoxyribonuclease I). Animals pretreated with cycloheximide (1 mg/kg s.c.) and injected 30 min later with two mg/kg colchicine had lesions similar to those treated with 0.4 mg/kg. On electron microscopy, these bodies ranged from 0.5-8.0 μm in diameter and were usually isolated from surrounding cytoplasm by a double membrane. The contents ranged from apparently normal mitochondria and endoplasmic reticulum to amorphous patches of cellular material. These lesions were never found to contain Golgi bodies and they did not invariably contain nuclei or nuclear remnants. It is suggested that this damage by colchicine is similar to that reported for other drugs and possibly results from the effect of colchicine inhibition of microtubular formation. The protection offered by cycloheximide is probably due to interference with the cellular response to injury through inhibition of enzyme and protein synthesis.

8012 DEGENERATION OF ADRENERGIC AXONS IN THE LONGITUDINAL MUSCLE COAT OF THE RAT DUODENUM FOLLOWING TREATMENT WITH 6-HYDROXYDOPAMINE. *(E.)* Wong, W. C. (Dept. Anatomy, Univ. Singapore, Sepoy Lines, Singapore 3). *Experientia* 31(9):1080-1082, 1975.

The degeneration of adrenergic axons in the longitudinal muscle coat of adult albino rat duodenum after a single i.v. injection of 6-hydroxydopamine (100 mg/kg of 6-OHDA through the saphenous vein) was described. Rats were sacrificed one hr after injection. Electron microscopy of the longitudinal muscle coat of untreated rats revealed that the coat was 30-35 μm thick, thinner than circular coat (4/5 of the latter's thickness). The 6-OHDA-treated rats showed small- to medium-sized nerve bundles in the core of the longitudinal coat with axons sometimes seen to approach individual muscle fibers. Adrenergic axons within nerve bundles with small granulated vesicles, agranular vesicles and large granular vesicles were observed. Signs of early degeneration (general darkening, swollen vesicles and degenerating mitochondria) were seen in some of the axons. The pattern of innervation of the longitudinal coat of the rat duodenum resembled the multi-axonal neuromuscular relation described in the smooth muscle of the anuran gut; most of the junctions had wide gaps, 150 mm or more. The ratio of thickness between longitudinal and circular muscle coats in the rat duodenum and guinea pig ileum were different: 4:5 and 1:2, resp. Thus, 6-OHDA may be used in combination with electron microscopy to demonstrate the presence and distribution of adrenergic axons in the muscularis externa of the mammalian gut. In addition, regional differences in the adrenergic innervation of the smooth muscle of the mammalian gut were confirmed.

8013 EFFECTS OF PROLONGED ADMINISTRATION OF TRITON WR-1339 TO THE RAT ON MORPHOLOGY AND PHOSPHOLIPIDS OF LIVER. *(E.)* Huterer, S.; Phillips, M. J.; Wherrett, J. R. (Toronto General Hosp., Toronto, Canada). *Lab. Invest.* 33(3):305-310, 1975.

The effects of continuing administration of Triton WR-1339 on phospholipid composition and morphology in male Wistar rat liver were investigated. Fifteen rats received a series of ten injections of Triton WR-1339 (170 mg, i.p.) over a period of four weeks. Twelve of the animals were killed in groups of three on days 4, 10, 18, and 28 following the last injection. The remaining three animals were allowed to recover for two weeks before being sacrificed. Three additional rats were used as controls, received no injections, and were killed on day 28. Light and electron microscopy and analysis of liver lipids and acid phosphatase were performed on all animals. Treatment with Triton WR-1339 caused the appearance in both hepatocytes and Kupffer cells of secondary lysosomes, which increased in number and size during the course of treatment. The change in hepatocytes disappeared almost completely by two weeks after cessation of treatment whereas this change became accentuated in the Kupffer cells. A 75% increase in the concentration of lipids taken into the liver was noted, along with a 17% decrease in the concentration of total phospholipid and a 26% increase in acid phosphatase. Small decreases were observed in phosphatidylethanolamine (302-241 µg/g fresh weight), phosphatidylcholine (662-500 µg/g), and diphosphatidylglycerol (77-52 µg/g). A small increase was noted in sphingomyelin (71-83 µg/g) and a large increase in bis(monoacylglyceryl)-phosphate (2.5 to 55 µg/g). Cerebrosides were also increased. In the rats that were given two weeks to recover, those classes whose values had been decreased by the treatment showed a trend to return to control values; however, classes whose values were increased diverged further from control values. The results suggest that bis(monoacylglyceryl)phosphate is localized to lysosomes and, in addition, that lysosomal material is transferred from hepatocytes to Kupffer cells.

8014 ANASTOMOTIC VESSELS DIGESTIVE ARTERIES. A TOPOGRAPHIC STUDY. *(Fr.)* Bennet, J. M.; Bigot, J. M.; Monnier, J. P. (Hopital St. Antoine, Service de Radiologie, 27, rue Chaligny, F 75012 Paris, France). *Ann. Radiol.* 17(5):507-518, 1974.

Using arteriograms processed over a 4-yr period, common and infrequent anastomoses were investigated to help in the treatment of thrombosis and digestive trunk stenosis, and to aid in the efficiency of surgical procedures. The anastomosing networks which were always present were the pancreaticoduodenal arches joining the celiac trunk to the superior mesenteric artery *via* the gastroduodenal artery. Another consistent feature was an anastomosis stemming from the right gastroepiploic artery, reuniting the superior mesenteric artery to the celiac trunk. Riolan's arch, which anastomoses the superior mesenteric artery to the inferior mesenteric, was also seen consistently. Rectal anastomoses were quite common, and united the inferior mesenteric artery to the branches of the hypogastic artery. Uncommon anastomoses appeared irregularly and were often associated with pathological conditions. Anastomoses *via* Tandler's arch, Kurk's arch and the dorsal pancreatic artery may join the celiac trunk and the superior mesenteric artery. The hepatic artery anastomosed with the left gastric artery and bridges between hepatic branches were also seen. The hepatic and the splenic arteries may anastomose with the pyloric-left gastic anastomosis, and with the left and right gastroepiploic arteries. The importance of these anastomoses in the development of collateral circulation at the time of aortic thrombosis is stressed.

8015 THE HISTOLOGICAL STATE OF THE GASTRIC AND DUODENAL MUCOSA IN HEALTHY VOLUNTEERS [abstract]. *(E.)* Roca, M.; Truelove, S. C.; Whitehead, R. (Radcliffe Infirm., Oxford, England). *Gut* 16(5):404, 1975.

8016 COMPARATIVE SURFACE MICROANATOMY OF HEPATOCYTES AND SINUSOIDAL ENDOTHELIAL CELLS IN MOUSE, RAT, AND RABBIT [abstract]. *(E.)* Nopanitaya, W.; Grisham, J. W. (Sch. Med., Univ. North Carolina, Chapel Hill). *Gastroenterology* 68(4):1060, 1975.

8017 EFFECT OF DIOCTYL SODIUM SULFOSUCCINATE (DSS) ON STRUCTURE AND FUNCTION OF HUMAN AND RAT INTESTINE [abstract]. *(E.)* Saunders, D. R.; Sillery, J.; Rachmilewitz, D. (Dep. Med., Univ. Washington, Seattle, Wash.). *Gastroenterology* 68(4):980, 1975.

8018 ULTRASTRUCTURAL LOCALIZATION OF IgA AND SECRETORY COMPONENT (SC) IN HUMAN INTESTINAL MUCOSA BY IMMUNOPEROXIDASE TECHNIQUES [abstract]. *(E.)* Brown, W. R.; Isobe, Y.; Nakane, P. K. (VA Hosp., Denver, Colo.). *Gastroenterology* 68(4):869, 1975.

See also, 8150, 8156, 8205, 8207, 9040, 9149, 9387.

8019 SURFACTANTS AND BIOELECTRIC PROPERTIES OF RAT JEJUNUM. *(E.)* Feldman, D. S.; Rabinovitch, S.; Feldman, E. B. (State Univ. New York Downstate Med. Cent., Brooklyn). *Am. J. Dig. Dis.* 20(9):866-870, 1975.

The effects of nonionic (polyoxyethylene sorbitan oleate or Tween 80), anionic (sodium *n*-dodecylsulfate), and cationic (cetyltrimethylammonium bromide or cetrimide) surfactants on transmural potentials, short-circuit currents, and tissue resistance were studied *in vitro* in segments of rat jejunum. The mucosal and serosal compartments were perfused separately: with glucose and no surfactant (control), and with glucose and 10 mM surfactant. The resistance of the bathing solution was unaffected by the addition of surfactants. However, with Tween 80, the transmural potential difference increased by 1/3, the short-circuit doubled, and the resistance decreased by 30%. With sodium dodecylsulfate, the transmural potential difference increased by 20%, the short-circuit current increased by 66%, and the resistance decreased by 19%. In contrast, cetrimide decreased the transmural potential by 23%, decreased the short-circuit current by 34%, and increased the resistance by 22%. The bioelectric effects were reversible when test solutions were replaced with buffer. When electrical activity was measured in tissues exposed to surfactants in sodium sulfate buffer with no chloride ions, the bioelectric effects of the surfactants were negligible or were opposite to the effects obtained in the presence of chloride ions. Three analogs of sodium dodecylsulfate (6-ethyl-3-decylsulfate, sodium dodecane 1,12-disulfate, and cyclic sodium dodecylsulfate) had no significant effect on the bioelectric properties of tissues bathed in buffer containing chloride ions. Tween 80 produced no changes in bioelectric properties when introduced into the serosal chamber.

8020 A COMPARISON OF STABLE AND ^{3}H-LABELLED POLYETHYLENE GLYCOL 4000 AS NON-ABSORBABLE WATER PHASE MARKERS IN THE HUMAN ILEUM AND FAECES. *(E.)* Krag, E.; Krag, B.; Lenz, K. (Gentofte Univ. Hosp., DK-2900 Copenhagen/Hellerup, Denmark). *Scand. J. Gastroenterol.* 10(1):105-108, 1975.

[^{3}H]-labeled polyethylene glycol and stable polyethylene glycol 4000 were compared as nonabsorbable water phase markers in five patients with nonoperated regional ileitis (Crohn's disease). A four-lumen polyvinyl tube with a proximal occlusive balloon and a distal mercury bag was passed nasally into the fasted subjects until the mercury bag was in the cecum or within 10 cm of the ileocecal valve. The subjects were then perfused for 90 min each with four consecutive solutions. Some of the solutions contained 0.25 to 2.50 mM/l of glycochenodeoxycholic acid, and all of them contained polyethylene glycol 4000 (5 g/l) and [^{3}H]-polyethylene glycol 4000 (5 μCi/l). The feces and urine were collected for two days thereafter, and the stable and [^{3}H]-labeled polyethylene glycol concentrations were determined; the concentrations in the ileal infusates and aspirates were also determined. Turbidimetric assay and liquid scintillation counting yielded similar estimates of water absorption and secretion. Tracer amounts of ^{3}H were found in the urine, indicating minimal absorption. The data demonstrate the value of using [^{3}H]-labeled polyethylene glycol 4000 as a volume marker. The ^{3}H radioassay is simple and reproducible, the dose applied and the radiation energy are low, and the absorption is very low, so that the amount of exposure to ionizing radiation is negligible.

8021 ABSORPTION OF L-HISTIDINE AND GLUCOSE FROM THE JEJUNUM SEGMENT OF THE PIG AND ITS DIURNAL FLUCTUATION. *(E.)* Furuya, S.; Takahashi, S. (Dept. Nutrition, Natl. Inst. of Animal Industry, Chiba-Shi 280, Japan). *Br. J. Nutr.* 34(2):267-277, 1975.

Quantitative aspects of L-histidine and glucose absorption from the jejunum segment of female pigs (3 pigs, 10-15 weeks old) fitted with three simple cannulas were described. In addition, the diurnal fluctuations in L-histidine and glucose absorption with time after feeding were investigated. The pigs were given 40 g food/kg body weight once daily (at 8.30 hr) and weighed weekly. The maximum flow (958 g/hr) of digesta (collected 3 times/day) was obtained in the period 10.00 to 10.30 hr. The flow rate decreased with time after feeding, reaching a minimum (286 g/hr) in the period 22.00 to 22.30. Test solution concentrations ranged from 2.5 to 20 g/l for each material. The absorption rate for L-histidine and glucose increased in a hyperbolic manner with increasing concentrations of infused test material. L-histidine and glucose were absorbed nearly independently when perfused in combination. The absorption rates for glucose were significantly greater than the corresponding rates for L-histidine at each concentration of infusate. The absorption of both L-histidine and glucose (expressed as a percentage of the amounts in the perfusate) decreased as the flow rate of the perfusate increased from 400 to 800 ml/hr. The increase in flow rate from 400 to 800 ml/hr was associated with a 20% increase in L-histidine absorption rate; there was a 30% increase in glucose absorption rate when the flow rate was increased to 600 ml/hr, but no further increases at 800 ml/hr. The absorption of both L-histidine and glucose decreased with time after feeding; the absorption rates for L-histidine and glucose for the period 10.00-10.30 hr were 126 and 133%, resp., of those for the period 22.00-22.30 hr. It was concluded that the intestinal absorptive capacity is not the limiting factor in carbohydrate assimilation from the small intestine of the pig.

8022 THE ROLES OF BILE SALTS IN THE UPTAKE OF β-CAROTENE AND RETINOL BY RAT EVERTED GUT SACS. *(E.)* El-Gorab, M. I.; Underwood, B. A.; Loerch, J. D. (Div. Biological Health, Pennsylvania State Univ., Univ. Park, Pa. 16802). *Biochim. Biophys. Acta* 401 (2):265-277, 1975.

The possible roles of bile salts in the uptake of β-carotene and retinol under conditions simulating those present in the intestinal lumen during lipid absorp-

tion were investigated. Adult male Wistar rats were fasted overnight and their small intestines were removed. These everted guts were used to compare uptakes of [^{3}H]β-carotene and [^{3}H]retinol from micellar solutions and from emulsions of both bile salts and nonphysiological detergents (Tween 20 and hexadecyltrimethlammonium bromide). Varying bile salt concentrations (2-16 mM) enhanced the uptake significantly in micellar solutions and less significantly in emulsions. Maximum uptake occurred at the critical micellar concentration of the bile salt mixture (8-10mM). At higher concentrations, the β-carotene uptake level decreased and retinol absorption remained high. The physical state of the incubation medium as well as the detergent type affected the magnitude of the uptake. Regardless of the physical state, uptake in micellar solution was greater (1.2 to 3.5 times) than that in an emulsion mixture and uptake decreased in the following order: bile salts>Tween 20>hexadecyltrimethylammonium bromide. In β-carotene absorption, bile salts may have been required for interaction with the cell membrane or as a transport carrier. β-carotene cleavage and conversion to retinyl esters occurred only in bile salt solutions; retinol esterification was seen in all detergents. These effects increased with the tri-/dihydroxy bile salt ratio. β-carotene uptake was reversible, first order and passive at low concentrations, and 10% of the substrate was taken up after 60 min. Retinol uptake was much more rapid (50% taken up in 60 min), and was partially inhibited by 2, 4-dinitrophenol at higher concentrations. An energy requiring step is probably the rate-limiting factor.

8023 LIPID ABSORPTION IN BILE FISTULA RATS: LACK OF A REQUIREMENT FOR BILIARY LECITHIN. *(E.)* Rodgers, J. B. (Albany Medical Coll., Albany, N.Y. 12208). *Biochim. Biophys. Acta* 398(1):92-100, 1975.

Adult male Sprague-Dawley rats were used to test the effect of biliary or dietary phosphatidylcholine (lecithin) on the lipid absorption process. Experimental animals had a cannulation of the common bile duct to exclude bile from the intestine and a cannulation of the duodenum for infusion of diet and artificial bile; controls had only the latter. The diet was a basic amino acid liquid diet comprising 19 amino acids (including methionine), dextrin, sucrose, salt mixture RH and vitamin fortification mix (omitting choline chloride). The diet was infused for 48 hr through the duodenal cannula at a rate of 2.4 ml/hr. The amounts of total phospholipid, lecithin and phosphatidylethanolamine in microsomal preparations were quantified. Protein determinations as well as assays of acyl-CoA synthetase were performed. *In vivo* lipid absorption was studied using infusate labeled with [^{14}C] triolein. Acyl-CoA synthetase and monoglyceride acyltransferase levels decreased significantly. The composition of the microsomal membrane showed that the phosphatidylethanolamine content was less and the lecithin content was greater for controls than experimental rats. The *in vivo* group showed that recovery of labeled material was similar for the controls and for both bile fistula groups, suggesting that biliary and dietary lecithin were not essential for normal lipid absorption. In all groups, 70% of the recovered radioactive lipid was in the form of triglycerol, suggesting an excess of lipid re-esterifying enzymes in the bowel: less of the label was recovered from the ileal mucosa. Significant amounts of lecithin were recovered from the intestinal lumen of bile fistula rats which had not received the material in the duodenal perfusate. These results indicate that neither biliary or dietary lecithin is absolutely essential for the intracellular events that occur during fat absorption and transport.

8024 ABSORPTION OF INTACT PROTEIN BY COLONIC EPITHELIAL CELLS OF THE RAT. *(E.)* Worthington, B. S.; Enwonwu, C. (Dept. of Nutrition and Oral Biology, Univ. Washington, Seattle, Wash. 98195). *Am. J. Dig. Dis.* 20(8):750-763, 1975.

Colonic absorption of intact protein was examined over a four-wk period in ten adult male Sprague-Dawley (SD) rats using histological and ultrastructural procedures. The absorption was evaluated using ligated intestinal loop procedures; after flushing the lumen several times with saline solution, Sigma type VI horseradish peroxidase (5 mg/ml) was introduced into the ligated segment of the colon, and each loop was retained *in vivo* for 5, 10, 20, or 30 min. Two groups of controls were used, one which received peroxidase and another which did not. Light and electron microscopic evaluation of each control sample revealed a smooth surface with long crypts. Loops not exposed to intraluminal peroxidase demonstrated endogenous enzyme activity in red and white blood cells and around goblet cells in the epithelium. Neither exposure to horseradish peroxidase nor incubation in diaminobenzidine and/or hydrogen peroxide media produced noticeable alterations in histochemical, histological or ultrastructural characteristics of the control tissue. Histological examination of the experimental groups revealed evidence of peroxidase absorption by surface absorptive cells; the degree of mucosal penetration did not appear to relate to the degree of integrity of the colonic tissue. The mechanism involved a pinocytotic process followed by vesicular transport and exocytosis at lateral and basal cell membrances. It is known that in SD rats, endogenous peroxidase production by surface and crypt cells is minimal. It is possible that the observed transport phenomenon might contribute to the establishment of pathological changes in the colonic mucosa or to the manifestations of systemic disorders associated with circulating toxic and/or antigenic compounds.

8025 INHIBITION OF INTESTINAL ABSORPTION OF PHENYLALANINE BY PHENYLALANINOL. *(E.)* Shimomura, K.; Fukushima, T.; Danno, T.; Matsumoto, K.; Miyoshi, M.; Kowa, Y. (Safety Res. Lab., Tanabe Seiyaku Co. Ltd., Yodogawa-ku, Osaka 532, Japan). *J. Biochem.* 78(2):269-275, 1975.

The inhibitory effect of phenylalaninol on the intestinal absorption of phenylalanine in the phenylalanine load test and in the everted sac method was studied. In load tests, male Wistar rats received p.o. phenylalaninol dissolved in 300 mg/10 ml of

L-phenylalanine or pure water; 30, 60, or 90 min later plasma phenylalanine and tyrosine levels were determined by fluorometric methods. Ten ml/kg of L-phenylalanine solution without L-phenylalaninol was administered p.o. as a control. In everted sac experiments, the small intestine, from a point 34 cm under the pylorus, was quickly removed, rinsed, everted, and tied into sacs five to six cm (450-600 mg) in length; three sacs were prepared from each rat. L-phenylalanine or L-tyrosine in Krebs-Henseleit bicarbonate buffer, pH 7.4, containing 20 mM glucose was placed within the sacs (0.5 ml) at the same concentration as the solution outside the sacs (5.0 ml). Incubation time was one hr and the temperature was 37 C. In some experiments, phenylalaninol was added at a 5:1 or 10:1 ratio with respect to the other amino acids. Phenylalanine and tyrosine were assayed as in the other experiment. Sodium and potassium excretions in urine were determined in male Wistar rats that were divided into six groups, as follows: (1) L-phenylalanine (800 mg/kg); (2) L-phenylalanine (800 mg/kg) plus phenylalaninol (200 mg/kg); (3) L-phenylalanine (800 mg/kg) plus cycloleucine (200 mg/kg); (4) phenylalaninol (200 mg/kg); (5) cycloleucine (200 mg/kg); and (6) pure water. Individual rats were placed in a metabolic cage and urine was collected for six hr after p.o. administration of these compounds. Sodium and potassium were assayed by the flame photometric method. Since the amino acid levels in rats administered L-phenylalanine solution containing L-phenylalaninol were significantly lower than those in rats administered L-phenylalanine alone, L-phenylalaninol appears to inhibit the intestinal absorption of L-phenylalanine. This effect was more potent than that of cycloleucine. L-phenylalaninol inhibited the phenylalanine transport of everted sacs. The K_m value of L-phenylalanine was 3.44×10^{-3} M and the K_I value of L-phenylalaninol was 7.69×10^{-3} M from Lineweaver-Burk plots. From these two curves, it appears that L-phenylalaninol may competitively inhibit the intestinal transport of L-phenylalanine. Studies on the effects of L-phenylalanine, L-phenylalaninol and cycloleucine on the urinary excretions of Na^+ and K^+ in rats have revealed that potassium excretion (which increased on p.o. administration of L-phenylalanine) is suppressed by the administration of L-phenylalaninol but not by administration of cycloleucine. L-phenylalaninol alone enhanced Na^+ excretion in urine. These results confirm that L-phenylalaninol shows inhibitory effects as potent as those of cycloleucine on the intestinal absorption of L-phenylalanine.

8026 TRANSPORT STUDIES IN THE SMALL BOWEL OBSTRUCTION OF THE RAT. *(E.)* Merkle, P.; Breitig, D.; Bindewald, H. (Klinische Grundlagenforschung der Universitat Ulm, Ulm, West Germany). *Digestion* 12(2):111-113, 1975.

The authors simultaneously studied active and passive transport (diffusion) *in vivo* to clarify which factors may be responsible for the reduced transport capacity in obstruction. The small intestine was mechanically obstructed in male SPF rats anesthetized with ether 25 cm below the ligament of Treitz. After 24 and 48 hr, the obstructed bowel was emptied over a length of 20 cm and the content was measured. It was replaced by an identical amount (approximately 2 ml) of Ringer's solution containing 1 µCi ^{14}C-glucose and 2 µCi ^{3}H-antipyrine. After 15 min this solution was removed, and the bowel was rinsed by additional two ml of Ringer's solution. The size of the different groups varied from 9 to 13 animals. The remaining radioactivity was determined using a liquid scintillation counter (Packard). The absorption rates corresponded to the total given activity minus the measured rest-activity. Control rats were sham-operated (laparotomy), and a bowel piece of the same length was filled with two ml of the above described labeled solution, which was also removed after 15 min. The absorption of ^{3}H-antipyrine after 24 hr was significantly reduced in the obstructed bowel compared to controls and it was only slightly further reduced after 48 hr. The absorption of ^{14}C-glucose after 24 hr was similarly reduced but was distinctly further decreased after 48 hr. The energy-dependent absorption of glucose was altered in occlusion and decreased corresponding to the duration of obstruction. These findings agree with the *in vitro* studies of Kubrova et al. (1973). The authors conclude that up to 24 hr after occlusion, disturbance of mucosal permeability is the main cause for the reduced absorption capacity and that this disturbance most probably is a consequence of bowel edema, which can be seen histologically in this phase. They state that the further decrease of absorption capacity 48 hr after occlusion concerns mostly the active transport and must be caused metabolically; obviously a tissue hypoxia must be present at this stage. This hypothesis is supported by the fact that in other studies no alteration of capillary circulation could be observed in obstruction.

8027 PLASMA DISAPPEARANCE OF SULFOBROMOPHTHALEIN OR INDOCYANINE GREEN IN UNCONJUGATED HYPERBILIRUBINEMIA. *(E.)* Yeary, R. A.; Wise, K. J. (Dept. of Veterinary Physiology and Pharmacology, Ohio State Univ., Columbus, Ohio, 43210). *Res. Commun. Chem. Pathol. Pharmacol.* 12(1):125-136, 1975.

The effect of unconjugated hyperbilirubinemia on hepatic dye transport in adult Gunn rats was compared to the dissappearance rates of both indocyanine (ICG) and BSP. Lightly anesthesized rats of either genotype (icteric homozygous or nonicteric heterozygous) were injected with BSP at doses of 40, 60, 100 or 150 mg/kg followed by ICG at 4, 8, or 64 mg/kg; samples were drawn after 1, 5, 10, 20, 30, 45 and 60 min. Bilirubin, BSP and ICG have been found to be bound to ligandin (a cytoplasmic protein identified as glutathionine S transferase B) in the hepatocyte. Bilirubin did not compete for the ligandin binding sites of BSP or ICG in the intact rat. Neither ICG nor BSP had any effect on the plasma disappearance of bilirubin. In contrast, rifamycin nonselectively decreased bilirubin content of the supernatant fraction, ligandin and Z protein in rat liver homogenates and produced an increase in plasma bilirubin. A plasma membrane uptake unrelated to intracellular transport was observed following simultaneous injection of bilirubin and ICG and it did not affect the plasma dis-

appearance of bilirubin-pretreated rats. Rifamycin had a similar effect on hepatic uptake of ICG. The high binding affinity of bilirubin for plasma proteins overran the small quantities of unbound bilirubin in cellular uptake competition of ICG unless the two substances were injected simultaneously. Phenobarbital pretreatment increased the rate of plasma disappearance of BSP when 80 mg/kg were injected i.p. in icteric rats. This report seems very much in agreement with other experiments on the same issues.

8028 AMINO ACID MOVEMENTS ACROSS THE WALL OF ANURAN SMALL INTESTINE PERFUSED THROUGH THE VASCULAR BED. *(E.)* Boyd, C. A. R.; Cheeseman, C. I.; Parsons, D. S. (Dept. Biochemistry, South Parks Rd., Oxford, OX1 3QU, England). *J. Physiol.* 250(2):409-429, 1975.

L-leucine transfer across the wall of the small intestine was studied in a vascularly perfused preparation from four species of frog (*Rana pipiens, R. catesbeiana, R. temporaria* and *R. ridibunda*). Some modifications of the original procedure were made: e.g., the cannulation of the portal vein permitting continuous sampling of the tissue vascular effluent was achieved by leaving the intestine *in situ* in the animal. L-leucine was estimated by the L-amino oxidase-peroxidase technique. In the steady state of absorption, the transfer function relating the net flux of exogenous L-leucine into the vascular bed to the concentration in the lumen exhibited saturation. The apparent concentration in the lumen for half-maximum transfer of L-leucine was 2.1 mM. Removal of the Na ions from the lumen inhibited the transfer of L-leucine into the vascular bed. Additional removal of Na ions from the fluid in the vascular bed was further inhibitory to the transfer of the amino acid. L-leucine that was previously absorbed from the lumen appeared in the vascular bed in a biphasic fashion. In addition, the size of the L-leucine pool within the tissue that drains into the vascular bed was estimated. It was concluded that failure to achieve consistent and high portal effluent flow was largely due to mechanical factors; careful and accurate positioning of the portal cannula within the portal vein can be used to overcome a reduced collection rate due to portal vein occlusion.

8029 UPTAKE OF 5-METHYLTETRAHYDROFOLIC ACID BY THE RAT JEJUNUM. *(E.)* Blair, J. A.; Matty, A. J.; Razzaque, A. (Dept. Chemistry, Univ. Aston in Birmingham, Birmingham B4 7ET, England). *J. Physiol.* 250(2):221-230, 1975.

The transport of 5-methyltetrahydrofolic acid at various concentrations and different pHs in male Wistar rat jejunum was studied using an everted sac technique and an isolated mucosal cell preparation. Serosal and tissue uptake of 5-methyltetrahydrofolic acid was linear for 60 min with 10^{-5} M 5-methyltetrahydrofolic acid in the mucosal medium. Tissue uptake was much higher than serosal uptake. From studies with no initial concentration gradient of 5-methyltetrahydrofolic acid at 37 C, a mean ratio of 1.08 final mucosal concentration was obtained for a 15-min incubation period, suggesting no transport against an electrochemical gradient. At "zero" concentration gradient, the tissue appeared to concentrate 5-methyltetrahydrofolic acid from both mucosal and serosal media. Transport studies at 27 C with 10^{-5} M 5-methyltetrahydrofolic acid in the mucosal medium gave a Q_{10} value of 1.8; concentrations ranging from 10^{-7} to 10^{-4} M failed to show any saturation of uptake, indicating that movement of 5-methyltetrahydrofolic acid occurred by passive diffusion. The characteristics of 5-methyltetrahydrofolic acid uptake suggest a non-saturable transport mechanism. In uptake studies with isolated cells at pH 7.0, all the uptake took place within three min, suggesting a rapid binding of 5-methyltetrahydrofolic acid to cell surface protein rather than transport into the cell. At pH 5.0 there was a similar rapid uptake within the first three min followed by a slower but significant uptake in the next three min. This latter uptake may represent transport into the cell. It is concluded that the existence of an acid microclimate at the mucosal surface of the jejunum allows for the passive absorption of 5-methyltetrahydrofolic acid as the neutral zwitterion, and that this acid microclimate is most likely located in the glycocalyx.

8030 EFFECTS OF SUGARS ON LEUCINE AND LYSINE UPTAKE BY INTESTINAL CELLS FROM RATS FED SUCROSE AND STOCK DIETS. *(E.)* Reiser, S.; Michaelis, O. E., IV; Hallfrisch, J. (Nutr. Inst., Agr. Res. Serv., U. S. Dep. Agr., Beltsville, Md.). *Proc. Soc. Exp. Biol. Med.* 150(1):110-114, 1975.

The effects of fructose, glucose, and sucrose on the uptake of leucine and lysine by isolated rat intestinal cells was studied *in vitro*. Male weanling Wistar rats were maintained for 9-10 weeks on a commercial ground stock diet or a diet containing 65% sucrose, 20% casein-lactalbumin, 5% corn oil, 5% salt mix, 4% cellulose, and 1% vitamins. The isolated intestinal cells from these animals were incubated in a modified oxygenated Krebs-Ringer phosphate buffer containing radioactive and nonradioactive leucine or lysine (1 mM) and nonradioactive sugars (10-20 mM). The food intake and weight gain values did not differ significantly between the stock diet-fed and sucrose-fed rats. Leucine uptake by the cells was increased by adding 10 mM fructose and inhibited by adding 10 mM glucose or 20 mM sucrose to the medium; the results were similar in cells obtained from the 2 dietary groups. The major dietary effect noted was a significantly increased inhibition of leucine uptake by glucose in the sucrose-fed rats. The uptake of lysine by the intestinal cells was minimally affected by the added sugars regardless of the diet fed. These results demonstrate an important dichotomy in the properties of glucose and fructose transport in the intestine and suggest that dietary fructose may increase the transport of certain amino acids.

8031 ON THE MECHANISM OF SUGAR AND AMINO ACID INTERACTION IN INTESTINAL TRANSPORT. *(E.)* Murer, H.; Sigrist-Nelson, K.; Hopfer, U. (Federal Inst. Technology, Zurich, Switzerland). *J. Biol. Chem.* 250(18):7392-7396, 1975.

The influence of amino acids on D-glucose transport was studied in isolated vesicles of brush border membranes from rat small intestine. Both D- and L-alanine inhibited D-glucose transport (42 and 21%, resp.), L-alanine being the more effective of the isomers. Neither L- nor D-alanine influenced the equilibrium uptake of D-glucose at the 30-min time point. Transport interaction depended on amino acid flow rather than on concentration. Preincubation of the membranes with L-alanine abolished the inhibitory effect on D-glucose uptake. Counter transport of D-glucose and L-alanine was also noted. There was no influence of L-alanine on D-glucose uptake in the absence of Na^+ or K^+. When an antibiotic (monactin or valinomycin) was added to the membranes and D-glucose and L-alanine transport were measured in the presence of a driving force (in the form of an NaSCN gradient), the concentrative, overshooting nonelectrolyte uptake was abolished. D-glucose or L-alanine transport in the absence of a driving force (after preincubation with NaSCN) was not changed by either antibiotic. The equilibrium uptake value was also unaffected by monactin or valinomycin. When the antibiotics were tested with respect to their influence on transport interaction, monactin and valinomycin released the inhibition of D-glucose uptake by L- and D-alanine. The antibiotics had no influence on D-glucose uptake in the absence of amino acids. Monactin was effective in the presence of Na^+ without addition of further cations; the effect of valinomycin was only observed with K^+ also present in the medium. These experiments provide evidence that the Na^+-dependent sugar and amino acid fluxes across the brush border membrane are coupled electrically.

8032 HEPATOCELLULAR UPTAKE OF BILE ACIDS IN THE DOG: EVIDENCE FOR A COMMON CARRIER-MEDIATED TRANSPORT SYSTEM. *(E.)* Glasinovic, J. C.; Dumont, M.; Duval, M.; Erlinger, S. (Hopital Beaujon, 92110 Clichy, France). *Gastroenterology* 69(4):973-981, 1975.

This study compared the uptake of taurocholate (TC) by dog liver to the uptake of taurochenodeoxycholate (TCDC) and examined the influence of TCDC on TC uptake. Two series of experiments were performed. In the first, designed to study the influence of TCDC on TC uptake, a mixture was injected into the portal vein containing: (1) a tracer dose of (24 ^{14}C) sodium TC; (2) a known dose of unlabeled TC; and (3) a dose of 1.5 μM/kg body weight of unlabeled TCDC. The total dose of TC in the injection mixture was varied at each injection, but the dose of TCDC was the same for all experiments. In the second series, designed to compare the hepatic uptake of TC and TCDC, a mixture was injected in each experiment containing: (1) a tracer dose of (^3H)sodium TC; (2) a tracer dose of (24 ^{14}C)sodium TCDC; and (3) a known equimolar dose of unlabeled TC and TCDC, the equimolar dose being varied at each injection. Two reference tracers were injected simultaneously with the mixture described for each series of experiments: ^{51}Cr-labeled red cells as a vascular indicator and ^{125}I-labeled albumin as an extravascular indicator. The analysis of the dilution curves fitted well a three-compartment model, and no return of the extracted bile acids to the extracellular space was detected. The initial space of distribution of TC in the presence of a fixed dose of TCDC was approximately 1.25 times greater than that of albumin. Analysis of the data for TC uptake in the presence of TCDC was consistent with Michaelis-Menten kinetics, as previously established for TC alone. The calculated initial maximal velocity of uptake (V_{max}) of TC in the presence of TCDC was about 4.92 μM/sec/100 g of liver. This value was not significantly different from the V_{max} previously calculated for TC alone. The apparent K_d (dose of TC yielding half-maximal velocity) was approximately 18.10 μM/100 g of liver, a value significantly higher than that obtained in the absence of TCDC. A K_I (the Michaelis-type constant characterizing the inhibition of TC uptake by TCDC) of 2.71 μM of TCDC/100 g of liver was calculated. These observations are consistent with competitive inhibition of TC uptake by TCDC, and thus with the existence of a common carrier-mediated transport system for TC and TCDC. Estimation of the kinetic characteristics of the two bile acids from dilution curves obtained simultaneously showed that the affinity for the carrier was higher for TCDC than for TC but that the maximal capacity was lower for TCDC than for TC.

8033 CHARACTERIZATION OF THE PASSIVE AND ACTIVE TRANSPORT MECHANISMS FOR BILE ACID UPTAKE INTO RAT ISOLATED INTESTINAL EPITHELIAL CELLS. *(E.)* Wilson, F. A.; Treanor, L. L. (Vanderbilt Univ. Sch. Medicine, Nashville, Tennessee 37203). *Biochim. Biophys. Acta* 406(2):280-293, 1975.

The characterization of the transport mechanisms for bile acid uptake into metabolically viable cells from rat jejunum and ileum is reported. Intestinal epithelial cells from female Sprague-Dawley rats were strained through nylon stocking material and centrifuged at 200 X *g* for 10 min. Measurements of $^{14}CO_2$ production from (1-^{14}C)glucose were performed. Glycolytic activity was determined by measuring lactate formation from glucose. All measurements of lactate production were corrected for the amount of lactate present in cells at the start of the incubation. Oxygen consumption was recorded polarographically at 27 C. The measurements were started after 1 to 4 mg of cellular protein was added to Tris buffer. The current output from the electrode was calibrated by using solutions of known oxygen content. In flux rate experiments, essentially instantaneous, unidirectional uptake rates for bile acids were determined using isolated intestinal cells. ^{14}C-labeled bile acid, ^3H-labeled bile acid, and unlabeled bile acid included taurocholate, taurodeoxycholate, glycocholate, glycochenodeoxycholate, glycodeoxycholate, cholate, chenodeoxycholate, and deoxycholate. Protein content was assayed in aliquots of cell suspensions. These studies demonstrated that criteria for passive diffusion of bile acids were satisfied in mucosal epithelial cells isolated from

rat jejunum. The apparent permeability coefficients, P(app), for the bile acids varied in a regular manner, from 24.9 (taurocholate) to 1563 (deoxycholate) nM/min/100 mg protein/mM, dependent upon their molecular structure; from these data an incremental free energy change for the addition of a hydroxyl, glycine and taurine group to a bile acid molecule was calculated to be 892, 1040 and 1464 cal/M, resp. Following subtraction of the passive component in isolated ileal cells, complete kinetic curves for taurocholate and taurodeoxycholate yielded V(app) (maximal transport velocity) values of 109 and 70 nM/min/100 mg, resp. K_m(app) (Michaelis constant) values of 0.24 mM (taurocholate) and 0.10 mM (taurodeoxycholate) were lower than usually recorded in whole tissue. Bile acid uptake into cells from ileum, but not jejunum, was affected by temperature, metabolic factors and competitive inhibition. These studies indicate that isolated epithelial cells are a metabolically viable, relatively purified intestinal preparation which discriminate between active and passive transport processes for bile acids under conditions where unstirred water layer artifacts are minimized.

8034 HEPATIC BILE ACID TRANSPORT: EFFECT OF CONJUGATION AND POSITION OF HYDROXYL GROUPS. *(E.)* Hoffman, N. E.; Iser, J. H.; Smallwood, R. A. (Austin Hosp., Heidelberg, Victoria, 3084, Australia). *Am. J. Physiol.* 229(2):298-302, 1975.

The hepatic transport of five bile acids was studied in bile fistula rats. Adult male Sprague-Dawley rats were anesthesized and the common bile duct was cannulated. The portal vein was displayed and the rate of bile flow was measured. A 0.2 ml mixture of paired, labeled bile acids in 0.9% sodium chloride was injected into the portal vein as a sharp pulse (over 1 to 2 sec), and the secretion of the radiolabel in bile was measured over the next 15 min by liquid scintillation spectrometry. Six rats were injected with a pair of bile acids, one of which was labeled with ^{14}C and the other with ^{3}H. Taurocholic acid *vs* glycocholic acid, taurocholic acid *vs* cholic acid and glycocholic acid *vs* cholic acid were the pairs tested to assess the effect of conjugation on transport. Cholic acid *vs* deoxycholic acid and cholic acid *vs* chenodeoycholic acid were tested to assess the effect of varying the number and position of hydroxyl groups. Blood was sampled from the abdominal aorta in the 10 to 15 sec following injection. The examination of isotopic ratios showed that in none of the pairs studied were the two bile acids taken up with equal efficiency. Taurocholic acid was transported most efficiently, followed in order by glycocholic acid, cholic acid, deoxycholic acid and chenodeoxycholic acid. In every case the bile acid secreted more slowly appeared in greater amounts in the systemic blood. This suggests that hepatic uptake is a significant determinant of the differences in secretion rate, but that differential rates of movement across the cell may further influence the ultimate secretion profiles.

8035 EFFECT OF BILE SALTS ON AMINO ACID TRANSPORT BY RABBIT INTESTINE. *(E.)* Hajjar, J. J.; Khuri, R. N.; Bikhazi, A. B. (Sch. Medicine American Univ. Beirut, Beirut, Lebanon). *Am. J. Physiol.* 229(2):518-523, 1975.

The effect of bile salts on alanine absorption across four regional sites of rabbit intestine was examined using an *in vivo* single pass perfusion technique. The rabbits were tracheotomized and perfused with bile salt solution. The perfusion rate was constant at 0.28 to 0.30 ml/min. Effluent solutions were collected 45, 65, 85, and 105 min after the start of the perfusion. The mucosal-to-serosal flux (J_{ms}) and serosal-to-mucosal flux (J_{sm}) were measured in the presence and absence of different concentrations of Na-taurodeoxycholate (TDC). Na-deoxcholate (3 mM) reduced alanine absorption across all levels of intestine, and a higher concentration (10 mM) of TDC caused only a minimal reduction of alanine absorption in the jejunum. TDC was more effective in *in vitro* experiments, causing an increase in the transmural J_{sm} of alanine and phenylalanine, particularly when it was present in both the mucosal and serosal fluids. TDC reduced the alanine J_{ms} rate when present only in the mucosal fluid. TDC decreased the influx of amino acids across the mucosal brush border membrane. These amino acids transport changes correlated with some observed histological changes of the intestinal epithelium. Bile salt inhibition of amino acid absorption appeared to be nonspecific in type and could be the result of injurious action of these surface-active agents on the intestine. More direct studies of this inhibitory action of bile salts are necessary to further characterize the exact nature of this injury.

8036 THE EFFECT OF SOME IONIZED AND NEUTRAL SURFACTANTS AND BILE ACIDS UPON SODIUM AND WATER TRANSPORT FROM TIED JEJUNAL LOOPS IN ANAESTHETIZED RATS. *(E.)* Sund, R. B. (Inst. Pharmacy, Univ. Oslo, Oslo, Norway). *Acta Pharmacol. Toxicol.* 37(4):297-308, 1975.

The effects of various surfactants and of unconjugated and conjugated bile acids on the jejunal transport of sodium and water was investigated. The surfactants included dioctylsulphosuccinate, cetrimonium bromide, benzalkonium chloride and various nonionic surfactants, and the acids included desoxicholic acid and its glycine and taurine conjugates, cholic acid, and dehydrocholic acid. Anesthetized male rats were prepared with a tied jejunal segment (15 cm long) into which 2.0 ml test solution was instilled. After given periods of time the loops were removed, drained and washed. The amount of sodium recovered was determined by flame photometry and the amount of unabsorbed fluid by an indirect, gravimetric procedure. Dioctylsulfosuccinate sodium, benzalkonium chloride and cetrimonium bromide all inhibited sodium absorption and were capable of inducing net sodium secretion at high concentration. Most of the nonionic surfactants failed to alter sodium absorption significantly: Pluronic F68 had a slight inhibitory effect; Triton X100 (0.5%) inhibited sodium absorption completely; and Lubrol WX (0.5%) induced net secretion. Cholic acid and desoxicholic acid caused net secretion at higher concentrations, while glyco- and taurodesoxicholic acid

were significantly inhibitory at 12.8 nM. Dehydrocholic acid had very little effect on net sodium absorption and appeared dose-dependent. The testing of active compounds with hypertonic sodium sulfate revealed an augmented absorption of sodium. It is concluded that several substances of widely differing chemical structure have the same effect on the jejunal transport of water and sodium. This effect is probably due to some common physicochemical property, such as the surface activity of the compounds. It was also concluded that the observed change in transport pattern indicated that the surfactants caused increased passive permeability of the intestinal epithelium.

8037 REGIONAL DIFFERENCES IN THE EFFECT OF BILE SALTS ON ABSORPTION BY RAT SMALL INTESTINE IN VIVO. *(E.)* Saunders, D. R. (Dept. Biochemistry, Univ. Oxford, Oxford, England). *J. Physiol.* 250(2): 373-383, 1975.

The possible regulation of luminal water by bile salts in male Wistar and Sprague-Dawley rats was tested by examining the relation between taurocholate concentration and water transport in different regions of the rat small intestine. Net water transport was measured under steady-state conditions during single-pass infusion of segments from three regions of the small intestine. Each segment served as its own control. Taurocholate (5 mM), glycocholate (5 mM), and delipidated rat bile depressed water absorption in rat proximal jejunum but not in distal ileum. Water absorption in the ileum was uninhibited by concentrations of taurocholate up to 20 mM. Similar regional differences in the effect of bile salts on glucose absorption were noted. The ileum was less sensitive than the jejunum to the antiabsorption effect of 1 mM of deoxycholate. The addition of 1-palmitoyl,2-oleoyl lecithin (2-5 mM) counteracted the inhibitory effect of taurocholate and glycocholate on water absorption. Net water transport, a percentage of the control period, was inversely related to $\log_{10}$ (taurocholate concentration of infusate). These data are consistent with the observations on the cathartic effect of conjugated bile salts in human small intestine. The extent to which endogenous bile salts influence the fluidity of rat small intestinal contents depends on regional differences in absorptive functions. It is suggested that the bile salt active transport system conserves the bile salts, water, and electrolytes delivered to the rat ileum.

8038 SALMON CALCITONIN AND WATER AND ELECTROLYTE TRANSPORT IN RABBIT ILEUM. *(E.)* Gray, T. K.; Juan, D.; Powell, D. W. (Univ. North Carolina Sch. Med., Chapel Hill). *Proc. Soc. Exp. Biol. Med.* 150(1):151-154, 1975.

The effect of synthetic salmon calcitonin and partially purified salmon calcitonin on water and electrolyte transport in the rabbit ileum was studied using an *in vivo* perfusion technique and the *in vitro* Ussing chamber technique in male New Zealand white rabbits. The salmon calcitonin was administered by i.v. infusion (1-10 U/kg/hr) or by direct addition to the Ussing chamber solutions (10-144 U/ml). In addition to the transport rates of Na, Cl, and water across the ileum, determinations were made of the serum calcium concentrations, Na and Cl fluxes, potential differences, short-circuit current, and conductance. The administration of salmon calcitonin by i.v. infusion or by addition to the Ussing chamber had no detectable effect on water or electrolyte transport in the rabbit ileum. Similarly, no significant differences in the Na and Cl flux rates or the electrical measurements were detected when calcitonin-treated tissues were compared with control tissues; the addition of large doses (36-144 U/ml) of synthetic calcitonin to the Ussing chamber was, however, associated with a brief (less than 4 min) 25% increase in potential difference and short-circuit current. *In vivo* 3 U/kg/hr calcitonin significantly decreased the serum calcium level. In contrast to its effect in man, salmon calcitonin fails to influence the ileal transport of water and electrolytes in the rabbit. This may be due to differences in rabbit intestinal response to a foreign peptide hormone.

8039 INHIBITION OF INTESTINAL CALCIUM TRANSPORT BY LOCAL ANESTHETICS. *(E.)* Wrobel, J.; Michalska, L. (Dept. Biochem., Medical Sch., A. Zwyciestwa 42, 80-210 Gdansk, Poland). *Physiol. Chem. Physics* 7(3):209-214, 1975.

The inhibition of active calcium transport in Wistar rat duodenum by local anesthetics, including nupercaine, butacaine hemisulfate, lidocaine HCl, and procaine HCl was demonstrated. Calcium transport was studied *in vitro* using the everted sacs technique or special glass devices. Duodenal sacs were filled with 0.5 ml of medium and incubated in 5 ml of medium. Concentrative calcium transport was calculated from the difference between the amount of ^{45}Ca in the total final sac content and the amount in the initial sac content. Measurements of unidirectional transport were performed on everted duodenal segments. The rate of transport of a compound was calculated on the basis of the specific activity of the isotope in the compartment from which transport was occurring and the rate of the isotope appearance in the other compartment. All drugs tested strongly inhibited active calcium transport in a concentration-dependent fashion; nupercaine was the most effective. The inhibitory activity of the other anesthetics decreased in the following order: butacaine, lidocaine, procaine. The inhibitory effect of local anesthetics on intestinal calcium transport closely correlated with their anesthetic potency. The increase of $CaCl_2$ concentration (from 0.4 mM to 5.0 mM) had no effect on the degree of inhibition of calcium transport in the presence of all the anesthetics tested. Nupercaine exerted directionally oriented action on calcium transport; it inhibited mucosa-to-serosa transport but did not effect serosa-to-mucosa transport. With 1.0 mM nupercaine present in the medium, calcium transport in both directions was equal. In the absence of nupercaine, calcium transport from mucosa to serosa was four times that of the transport in the opposite direction. Thus, the observed influence

of nupercaine is not due to a simple difference in the permeability of duodenum for calcium ions, but rather to the inhibition of the active mechanism mediating calcium transport. In addition, the results suggest that the action of nupercaine is different from that of other metabolic inhibitors.

8040 THE INFLUENCE OF DIETARY CALCIUM AND PHOSPHORUS ON INTESTINAL CALCIUM TRANSPORT IN RATS GIVEN VITAMIN D METABOLITES. *(E.)* Ribovich, M. L.; DeLuca, H. F. (Coll. Agriculture Life Sci., Univ. Wisconsin, Madison, Wisc. 53706). *Arch. Biochem. Biophys.* 170(2):529-535, 1975.

The effects of dietary calcium (0.02%, 1.2%, or 2.0%) and phosphorus (0.1% or 0.3%) on intestinal calcium transport were studied in male weanling rats (Holtzman) given p.o. vitamin D_3 (25-1000 ng daily), 25-hydroxyvitamin D_3 (25-OH-D_3, 12.5-250 ng daily), or 1,25-dihydroxyvitamin D_3 (1,25-$[OH]_2D_3$, 7-25 ng daily p.o. or 12.5 ng daily s.c.). The rats were maintained on the experimental diets for three weeks; supplementation with vitamin D or metabolites was begun on the fifth or seventh day and continued throughout the remainder of the period. Intestinal adaptation to low calcium intakes occurred when the rats were supplemented daily with 250, 625, or 1000 ng of vitamin D_3, but not when they were given only 25 ng; the adaptive response was prolonged with increasing dosages of vitamin D_3. Similarly, rats given 12.5 ng of 25-OH-D_3 did not show a significant increase in intestinal calcium transport due to the low calcium diet, while intestinal adjustment to low dietary calcium levels was observed with dose levels of 25-250 ng. 1,25-$(OH)_2D_3$ did not affect the adaptation of intestinal calcium transport to dietary calcium. Low dietary phosphorus levels stimulated intestinal calcium transport to a greater extent than low dietary calcium levels. The stimulation of calcium transport by the low phosphorus diet was observed at all times following the last dose of either vitamin D_3 or 25-OH-D_3 as compared to the normal phosphorus diet. However, the elevation of intestinal calcium transport by low phosphorus diets was not eliminated by the administration of exogenous 1,25-$(OH)_2D_3$. The results suggest that in addition to stimulating 1,25-$(OH)_2D_3$ synthesis, low phosphorus diets must have some other unknown effect on intestinal calcium transport and that the stimulation of intestinal calcium transport by low dietary calcium is the direct consequence of increased 1,25-$(OH)_2D_3$ synthesis.

8041 POTASSIUM TRANSPORT ACROSS DISTAL COLONIC MUCOSA IN MAN [abstract]. *(E.)* Salas-Coll, C.; Kermode, J.; Edmonds, C. J. (Univ. Coll. Hosp. Med. Sch., London, England). *Gut* 16(5):408, 1975.

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8043 γ-GLUTAMYL TRANSPEPTIDASE OF RAT INTESTINE: LOCALIZATION AND POSSIBLE ROLE IN AMINO ACID TRANSPORT [abstract]. *(E.)* Hyman, P. E. (Massachusetts Gen. Hosp., Boston, Mass.). *Gastroenterology* 68(4):1090, 1975.

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8046 PARTIAL STARVATION ENHANCE POLYGLUTAMYL AND MONOGLUTAMYL FOLATE ABSORPTION IN RAT INTESTINE [abstract]. *(E.)* Solomons, N. W.; Chang, H.; Rosenberg, I. H. (Dept. Med., Univ. Chicago, Chicago, Ill.). *Gastroenterology* 68(4):1063, 1975.

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8048 COLONIC ABSORPTION OF BACTERIALLY SYNTHESIZED VITAMIN K-2 IN THE RAT [abstract]. *(E.)* Hollander, D.; Rim, E.; Muralidhara, K. S. (Div. Gastroenterol., Wayne State Univ., Detroit, Mich.). *Gastroenterology* 68(4):915, 1975.

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8051 HISTAMINE EFFECTS ON H+ PERMEABILITY BY ISOLATED GASTRIC MUCOSA [abstract]. *(E.)* Fromm, D.; Silen, M.; Robertson, R. (Harvard Med. Sch., Boston, Mass.). *Gastroenterology* 68(4):895, 1975.

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8054 THE ELECTROPHYSIOLOGICAL EFFECTS OF BURIMAMIDE AND 16,16 DIMETHYL PROSTAGLANDIN E_2 ON THE CANINE GASTRIC MUCOSA [abstract]. *(E.)* Bowen, J. C.; Kuo, Y. J.; Pawlik, W.; Williams, D.; Shanbour, L. L.; Jacobson, E. D. (Univ. Texas Med. Sch., Houston, Texas). *Gastroenterology* 68(4):867, 1975.

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8056 THE EFFECT OF ASPIRIN ON INTESTINAL GLUCOSE ABSORPTION IN MAN [abstract]. *(E.)* Arvanitakis, C.; Folscroft, J.; Chen, G. H.; Greenberger, N. J. (Kansas Univ. Sch. Med., Kansas City, Kans.). *Gastroenterology* 68(4):1054, 1975.

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See also, 8143, 8165, 8204, 8216, 8354, 8356, 8358, 8553, 8757.

8087 EFFECTS ON GASTRIC MOTILITY FROM THE CEREBELLAR FASTIGIAL NUCLEUS. *(E.)* Lisander, B.; Martner, J. (Dept. Physiology, Univ. Goteborg, Goteberg, Sweden). *Acta Physiol. Scand.* 94(3):368-377, 1975.

The fastigial influence on gastric motility in 43 chloralosed cats was investigated, and the nervous mechanisms involved were analyzed. The ability of fastigial stimulation to produce either gastric excitation or relaxation and the background of these responses were investigated by selective nerve sectioning and the administration of suitable autonomic blocking agents. Gastric motility was measured as volume changes in a large intragastric waterfilled balloon inserted into the stomach via esophagus. Pharmacological adrenergic blockade was induced by guanethidine (4-5 mg/kg body weight i.v.) alone or in combination with phentolamine (3 mg/kg body weight i.v.) and propranolol (0.5-1.0 mg/kg body weight i.v.). For cholinergic blockage, atropine sulfate (0.5-1.0 mg/kg body weight i.v.) or methylscopolamine (0.015-0.03 mg/kg body weight i.v.) was used. Suppression of prevailing gastric motility was found to be mediated mainly by increased discharge in adrenergic nerve fibers and also by adrenal catecholamine release. Gastric excitation could be induced in three different ways: first, *via* increased activity in vagal cholinergic fibers; second, by fastigial suppression of vago-vagal nonadrenergic relaxatory reflex. In addition, when laparotomy or other noxious abdominal stimuli had induced inhibitory gastric reflexes, the consequent sympathetic discharge could be suppressed by fastigial stimulation resulting in enhanced gastric motility. The importance of background activity in the various nervous pathways for the fastigially induced gastric responses is discussed.

8088 GASTRIC EMPTYING AND ITS RELATIONSHIP TO ANTRAL CONTRACTILE ACTIVITY. *(E.)* Stemper, T. J.; Cooke, A. R. (Veterans Hosp., Univ. Iowa, Iowa City, Iowa). *Gastroenterology* 69(3): 649-654, 1975.

Simultaneous measurements of gastric emptying and antral contractile activity in three dogs with gastric and duodenal fistulas were taken to determine the relation between antral contractions and the volume emptied. Two force strain gauge transducers were sewn to the serosal surface of the antrum of two dogs and a single strain gauge transducer was sewn on the serosal surface of both the antrum and fundus of the third dog. The frequency and the force of antral contractions were determined. Contractile activity was recorded simultaneously with gastric emptying and the number of contractions in each one-min period were counted. The measurements were begun three weeks after the operation and five min after the instillation of the test meal, and were continued for 15 min. The test meals (154 mM saline) of 60, 120, 240 or 480 ml were warmed to 37 C and instilled rapidly into the stomach *via* the gastric fistula. As the number of contractions/min increased (reaching a maximum at about four contractions/min), so did the volume emptied/min. Rapid gastric emptying was usually associated with an increase in the force of contractions. However, no contractions were recorded when a mean volume of 6.9 ml/min was delivered to the duodenum; 0-96 ml/min were emptied during maximal antral activity. Antral contractile activity increased with the size of the test meal, and decreased exponentially with the rate of gastric emptying. Fundal contractile activity was not present during the test meal. These studies suggest that although the antrum plays a significant part in the emptying of liquids from the stomach, other factors, such as the pylorus, the proximal stomach, and the proximal duodenum may modify its effects.

8089 THE EFFECT OF MANOMETRIC ASSEMBLY DIAMETER ON INTRALUMINAL ESOPHAGEAL PRESSURE RECORDING. *(E.)* Lydon, S. B.; Dodds, W. J.; Hogan, W. J.; Arndorfer, R. C. (Med. Coll. Wisconsin, Milwaukee). *Am. J. Dig. Dis.* 20(10):968-970, 1975.

The effect of manometric assembly diameter on the upper esophageal sphincter pressure and the peristaltic pressure amplitude in the esophageal body was studied in 6 normal human volunteers aged 18-22 yr. The manometric tube assembly featured 3 recording levels designated A, B, and C and measuring 3.3, 4.8, and 6.7 cm in diameter, resp. The assembly circumference at these 3 recording levels was 11, 17, and 22 mm, resp. After nasal intubation, the resting lower esophageal sphincter and upper esophageal sphincter pressure and peristaltic pressure complexes in the distal and proximal esophagus were recorded for each assembly diameter. The results indicated that increases in assembly diameter caused significant increases in the peristaltic pressure amplitudes and resting sphincter pressures in the smooth and striated muscle portions of the esophagus. This phenomenon is best explained by the length-tension characteristics of the esophageal muscle. Because recording assemblies produce luminal distension, the assembly causes radial stretch of circular esophageal muscle. The extent of this stretch is directly related to assembly diameter and circumference. These findings indicate that it is necessary to standardize manometric assembly diameter to permit valid comparison of esophageal pressure values obtained by different investigators.

8090 ELECTRICAL STIMULATION OF SMALL INTESTINAL ELECTRICAL CONTROL ACTIVITY. *(E.)* Sarna, S. K.; Daniel, E. E. (Depts. Surgery and Electrical Engineering, McMaster Univ., Hamilton, Ontario, Canada). *Gastroenterology* 69(3):660-667, 1975.

A study was made of electrically controlled motility in the small intestine of healthy female dogs. The electrical control activity (ECA) in the small intestine was driven by an electrical stimulus and the effects on the frequency and phase relations of control waves were recorded. The ECA in the small intestine could be driven from all sites from which it could be recorded. The mean maximum driven frequency (MDF) was highest near the pylorus (25.3 cycles/min), but decreased distally (14.1 cycles/min) at 10 cm from the ileocecal junction. However, at any given site, it was the same both before and

after the small intestine was divided into small segments (10-25 cm long). With an increase in plateau frequency, the length of the frequency plateau decreased and phase lag/cm increased. The direction of phase lag was orad proximal to a stimulation site and aborad distal to it. No effect was noted on the MDF in the frequency plateau region by atropine (up to 100 μg/kg, i.v.) or reserpinization of dogs before the experiment. The results confirm the validity of an array of bidirectionally coupled relaxation oscillators as a model of small intestinal ECA. It is concluded that electrical stimulation can be used to alter the small intestinal ECA frequency and phase relation among control waves. In addition, differences between the gastric and small intestinal ECA's were observed at the cellular level.

8091 A LINKED OSCILLATOR MODEL OF ELECTRICAL ACTIVITY OF HUMAN SMALL INTESTINE. *(E.)*
Brown, B. H.; Duthie, H. L.; Horn, A. R.; Smallwood, R. H. (Weston Park Hosp., Sheffield, S10 2SJ, England). *Am. J. Physiol.* 229(2):384-388, 1975.

A model was constructed in which the electrical slow-wave activity of the human small intestine was simulated by a series of 64 coupled electronic relaxation oscillators with a gradient of intrinsic frequencies. The wave output form was one in which the slope of the curve increased with time except at the turning points. Coupling between adjacent oscillators was intrinsically bidirectional, and the values of coupling between oscillators were uniform. Using only two coupled oscillators of different intrinsic frequencies, it was shown that as coupling was increased there came a point where the two oscillators ran at the same frequency. This frequency was at first raised above the intrinsic frequency of either oscillator and then fell progressively as coupling was increased. When all 64 oscillators were coupled at the same resistance, a frequency plateau of 12/min was formed for the first 20 oscillators; thereafter, there was a frequency gradient decreasing to 9/min. The frequency of the plateau was close to that of the first oscillators, all the other oscillators being raised above their intrinsic frequencies. While the frequency of the oscillators on the plateau was constant, the frequencies of the other oscillators fluctuated by about 5%. The length of the frequency plateau was decreased with a steeper frequency gradient and/or a decreased coupling factor. The phase shift between adjacent oscillators increased with distance down the plateau. Similarly, the cycle-to-cycle stability of the oscillators decreased distally. Although the phase relation of adjacent oscillators was almost constant with respect to time over most of the frequency plateau, this was not the case for the frequency gradient or escalator region; here it was found that batches of up to 20 adjacent oscillators could be in the same state. This batch of oscillators formed at the edge of the frequency plateau, then traveled down the model. The transit time of the group increased with decreasing coupling but was relatively unaffected by intrinsic frequency gradient. While this electronic analog model is based on inadequate physiological data regarding the size of oscillators and their intrinsic frequencies and coupling, it does mimic many properties of the intact small intestine.

8092 EFFECTS OF ESSENTIAL AND NONESSENTIAL AMINO ACIDS ON GASTRIC EMPTYING IN THE DOG. *(E.)*
Stephens, J. R.; Woolson, R. F.; Cooke, A. R. (Dept. Medicine, VA Hosp., Iowa City, Iowa 52240). *Gastroenterology* 69(4):920-927, 1975.

The aim of the research was to define the effects of amino acids on gastric emptying in healthy dogs. Five dogs with gastric fistulas (a Thomas cannula was put into the most dependent part of the stomach) were used (begun about 3 wks postoperatively and continued over a period of 7 months) to assess the effect on gastric emptying of: (1) two potent cholecystokinin (CCK) releasers, tryptophan and phenylalanine, and of six other essential amino acids; (2) the nonessential amino acids alanine, beta-alanine, arginine, asparagine, aspartic acid, citrulline, cysteine, cystine, glutamic acid, glutamine, D-glutamine, histidine, hydroxyproline, ornithine, proline, serine, tyrosine, and D-tryptophan; (3) four peptide and amino acid preparations; and (4) solutions of glucose, glycine, and mannitol. A plastic adapter with a stopcock was connected to the gastric cannula through which the test meals (two 25-min test meals, the first being a control, given in succession, with at least 20 min between each meal) were instilled and drained. Phenol red concentration (of the gastric contents) after alkalinization was determined spectrophotometrically at a wavelength of 558 nm. Of the essential amino acids, only tryptophan significantly slowed emptying, and only above 4 mM was there a difference between control and test meal. The delay in response to tryptophan was dose-related and approached maximum at 40 mM; D-tryptophan had no effect at these concentrations. In concentrations up to 80 mM, none of the nonessential amino acids slowed emptying significantly. The four peptide and amino acid preparations in concentrations ranging from 80 to 700 mOsM had dose responses identical to those of D-glucose, glycine, and mannitol at similar osmolalities. It is concluded that L-tryptophan, which is dose-dependent and stereospecific, is a uniquely potent delayer of gastric emptying in the dog. Phenylalanine did not slow emptying, which suggests that CCK release may not be the only mechanism by which tryptophan acts. The peptide and amino acid preparations (casein hydrolysate, Bacto-peptone, Amigen, FreAmine) seem to delay emptying by stimulation of osmoreceptors, which is distinct from the mechanisms of action of tryptophan.

8093 INSULIN-SECRETION AND INTESTINAL MOTILITY. *(Fr.)* Ruckebusch, M.; Fioramonti, J. (Laboratoire de Physiologie-Pharmacodynamie, ERA #271 CNRS, Ecole Nationale Veterinaire, 31076 Toulouse Cedex, France). *C. R. Soc. Biol.* 169(2): 435-439, 1975.

The relation between the variations in intestinal motor behavior and the release of endogenous insulin in species in which the motility during interdigestive spasms was similar was investigated in dogs and sheep. Simultaneous control of insulinemia, glycemia and electrical activity in the intestine was performed. Three dogs (15 kg each) and three sheep (40 kg each) underwent an electromyogram of

the jejunal wall for two to three hr/day. The results were quantified 24 hr/day for two months. Blood glucose levels in a 24-hr fasted animal were determined 40 and 20 min prior to, and every 20 min for 8 hr after each of the following activities: a meal, an insulin injection, a glucose perfusion, and a short chain fatty acid perfusion. In the dog, glucose perfusion had little effect, but p.o. administration of glucose induced intense jejunal activity as well as a tenfold insulin release. A 500 g meat meal resulted in an insulin response equal to a third of that resulting from an endogenous insulin. Glucose levels increased in all situations except after insulin injection. In sheep, ingestion of 1 kg of hay or perfusion with 1 mM/kg of a mixture of short chain fatty acids had little effect on endogenous insulin release. An intense jejunal activity was noted after perfusion with 1 mM/kg of sodium butyrate, which indicated higher than normal glucose levels. Intestinal motility in dogs appeared to be linked to insulin secretion. The measurements found in sheep might have been a result of unique factors in sheep glucose metabolism. The results indicate that insulin release induced by nutrients plays a major role in the control of intestinal motility in both species.

8094 EFFECTS OF SECRETIN AND CHOLECYSTOKYNIN ON MOTOR ACTIVITY OF HUMAN JEJUNUM. *(E.)* Dollinger, H. C.; Berz, R.; Raptis, S.; Von Uexkull, T.; Goebell, H. (Cent. Intern. Med. Pediatr., Univ. Ulm, Germany). *Digestion* 12(1):9-16, 1975.

The effects of i.v. secretin (1-2 U/kg/hr) and cholecystokinin (CCK, 1-2 U/kg/hr) on the motility of the human jejunum were studied in normal subjects, aged 20-25 yr. Motility was measured *via* pressure-sensitive radiotelemetering capsules which were ingested by the subjects; measurements were made during the infusion of saline (15 ml/hr) and during infusion of the 2 hormones at 2 dosage levels each. Secretin induced a significant and dose-dependent inhibition in the amplitude and duration of type I (nonrhythmic) and type III waves. No significant change occurred in the number of waves, amplitude index, motility index, or percentage of motor activity with 1 U/kg/hr secretin, but all of these parameters were significantly reduced by 2 U/kg/hr. CCK (1 U/kg/hr) significantly increased the amplitudes of the type III waves, but did not affect their duration or the amplitude or duration of type I waves. This dose had no obvious influence on the number of waves or the percentage of motor activity, but the amplitude index and motility index were significantly elevated. At a dose of 2 U/kg/hr, CCK increased the amplitudes, but not the durations, of both type I and type III waves; it also significantly increased the mean number of waves, the amplitude index, the motility index, and the percentage of motor activity. These findings suggest that secretin and CCK are involved in the mechanism modulating the motor function of the intestine. Since previous investigations demonstrated that the effects of CCK can be changed by p.o. administration of belladonna or by scopolamine *in vitro*, excitory cholinergic components may be present. Therefore, it is likely that CCK participates in the homeostatic mechanism controlling the neural regulation of intestinal motility.

8095 ACTION OF METIAMIDE ON THE LOWER ESOPHAGEAL SPHINCTER. *(E.)* Cohen, S.; Snape, W. J., Jr. (Hosp. of Univ. Pennsylvania, 3400 Spruce St., Philadelphia 19104). *Gastroenterology* 69(4): 911-919, 1975.

The action of metiamide (*N*-methyl-*N'*-{2-[(5-methylimidazol-4-y)methylthio]ethyl}-2-thiourea), an H_2 antagonist, was tested for its effect upon lower esophageal sphincter (LES) function in the anesthetized opossum species, *Didelphis virginiana*. After successful anesthesia, a heparin-treated cannula was inserted into the femoral vein of the test animals. Metiamide was administered as a constant i.v. infusion. Intraluminal pressures were measured through water-filled polyvinyl catheters connected to external transducers. LES pressure was recorded as mm of Hg with gastric fundal pressure used as a zero reference. Gastric secretion was obtained by continuous suction through a collecting tube with perforations four to eight cm below the distal pressure recording site. Specimens were collected over 10-min intervals. Control values of LES pressure were obtained after insertion of the i.v. cannula and before the instillation of drugs or hormones. A period of one hr for stabilization to baseline levels was observed after administration of each agent. Studies *in vivo* were performed using gastrin I (residue 2-17; hexadecapeptide amide) or metiamide. All studies were performed utilizing the continuous i.v. infusion of gastrin or metiamide over a one-hr period. Doses of gastrin or metiamide were given in random order. Studies *in vitro* were performed with circular smooth muscle of the distal esophagus at the region of the LES. The LES was identified by manometry, and was marked. In studies using a combination of metiamide with either gastrin or histamine, the metiamide was given prior to the other agent. In these studies, each muscle served as its own control. In additional isometric studies, muscle responses were evaluated during depolarization with 60 mM KCl. In these studies, the muscle was contracted submaximally with KCl and then was tested to either histamine or gastrin at the concentration shown to give the maximal active tension. The inhibitory responses to gastrin or histamine in this setting were evaluated for antagonism by metiamide (using isoproterenol or electrical stimulation of 60 v, 10 Hz for 1.0 msec). I.v. infusions of metiamide gave a dose-related increase in LES pressure. A maximum increase in pressure of 17 mm Hg was attained at 2.0 mg/kg-hr of metiamide. This dose of metiamide abolished acid secretion in response to gastrin I, but augmented the maximal LES response to this hormone. Studies *in vitro* showed that metiamide augmented the maximal LES muscle responses to gastrin I or histamine but had no effect on other agonist responses. Metiamide alone did not alter LES muscle tension. An inhibitory response to gastrin I or histamine could be demonstrated in the presence of atropine or diphenhydramine, resp., on muscle that had first been depolarized with KCl. These inhibitory responses were antagonized by metiamide. These studies indicate that metiamide (a) increases LES pressure, (b) selectively augments LES muscle excitatory responses to gastrin I or histamine, and (c) selectively antagonizes inhibitory muscle responses to histamine or gastrin I.

8096 THE MOTOR-STIMULATING EFFECT OF METOCLOPRAMIDE AND PYRIDOSTIGMINE BROMIDE IN NORMAL MAN AND LAPAROTOMIZED PATIENTS. A COMBINED STUDY OF DUODENAL ELECTRIC AND MOTOR ACTIVITY. *(Eng.)* Oigaard, A. (Righospitalet, Blegdamsvej 9, Copenhagen, DK-2100, Denmark). *Scand. J. Gastroenterol.* 10(5): 65-71, 1975.

The effects of metoclopramide (40 mg by i.v. drip infusion) and pyridostigmine bromide (1.5 mg by i.v. drip infusion) on duodenal motility were compared in 40 normal volunteers (20-35 yr old) and in eight patients (2 and 48 hr after i.p. operations). Motility was measured by means of simultaneous recordings of electrical action potentials (spike potentials) and intraluminal pressure variations; both probes were placed in the distal part of the descending duodenum. Both drugs caused a shift towards greater motility in the normal subjects. The increase was significant one min after metoclopramide administration and 5 min after pyridostigmine bromide administration; it was significantly greater after the former than after the latter. The increase in activity was also indicated by significant increases in the frequency of spike potential occurrence after drug administration; again, the increase was greatest after metoclopramide administration. Average activity was increased significantly after both drugs, but the increase was significantly greater with metoclopramide than with pyridostigmine bromide. The average activity before drug administration was significantly lower in the i.p. surgery patients than in the normal subjects. None of the patients showed any significant change in activity after metoclopramide or pyridostigmine bromide. The results suggest that metoclopramide may possibly be preferable to the commonly used parasympathomimetics for the stimulation of bowel function after abdominal surgery.

8097 REFLEXOGENIC CONTRACTION OF THE ILEO-CECAL SPHINCTER IN THE CAT FOLLOWING SMALL OR LARGE INTESTINAL DISTENTION. *(E.)* Pahlin, P. E.; Kewenter, J. (Dept. Surgery III, Sahlgrenska sjukhuset, Univ. Göteborg, Sweden). *Acta Physiol. Scand.* 95(1):126-132, 1975.

The effect of distension of a small or large intestinal loop on the feline ileo-cecal sphincter (ICS) was studied *in vivo* in adult male and female cats using a flow recording technique. Intestinal loops from the jejunum, ileum, and colon were prepared and used for intestinal distension or to record the motor activity. In some experiments, spinal anesthesia was employed, and in nine cases intestinal distention was performed before and after cervical vagotomy with or without cutting of the pelvic nerves. In addition, in some animals the two major splanchnic nerves were divided subdiaphragmatically and/or the lumbar colonic nerves were cut. I.v. atropine (1 mg/kg), phenoxybenzamine (5 mg/kg), propranolol (1-2 mg/kg), guanethidine (3 mg/kg), tetracain grave (10 mg/kg), and mepivacain chloride (20 mg/kg) were also used. Distension of a jejunal, ileal, or proximal colonic loop reduced or stopped the trans-sphincteric flow in all cases. The sphincter contraction was obtained at a distension pressure between 30 and 100 cm of H_2O. Concomitant with this contraction was an inhibition of tone and motor activity in the isolated intestinal loops. No relaxation of the sphincter was recorded when the intestinal distention was repeated after the tone of the sphincter had been increased by efferent splanchnic nerve stimulation or by distension of another intestinal segment. Similarly, no difference was observed in the sphincteric response to intestinal distension before and after the adrenal glands had been ligated; the intestino-ileo-cecal sphincteric reflex was unchanged after the vagal and/or pelvic nerves were cut; and the reflexogenic sphincter contraction was unchanged or reduced to only a minor extent after bilateral splanchnic nerve section. However, the contraction was totally or nearly totally abolished when the lumbar colonic nerves and splanchnic nerves were cut. The spinal anesthesia experiments indicated that the reflex was spinal. Atropine and propranolol did not block the contraction reflex, but guanethidine and phenoxybenzamine did. The results indicate that the excitatory intestino-ileo-cecal sphincteric reflex is a spinal reflex with the main afferent and/or efferent fibers located within the major splanchnic and colonic nerves. The excitatory motor response in the sphincter is adrenergic and mediated *via* α-receptors.

8098 INFLUENCE OF PUDENDAL BLOCK ON THE FUNCTION OF THE ANAL SPHINCTERS. *(Eng.)* Frenckner, B.; Euler, C. V. (Dept. Clinical Physiology, Serafimer Hosp., Stockholm, Sweden). *Gut* 16(6):482-489, 1975.

The respective contributions of the smooth internal sphincter and the striated sphincter muscles to anal pressure were mapped with the anal canal at rest, after an abrupt distension of the rectum with an air balloon, and during constant distension. Ten healthy subjects (3 women and 7 men, mean age 20 yr) were examined before and after the striated muscles had been completely paralyzed by bilateral pudendal block, making it possible to record the activity from the internal sphincter alone. The right leg of each subject was grounded *via* a plate electrode attached to the skin, and recordings were made from a concentric needle electrode inserted into the external sphincter and from a similar electrode inserted into the puborectalis muscle. Maximal anal pressure was significantly reduced after pudendal block, from a mean of 64 mm of Hg to 54 mm of Hg, indicating that the internal sphincter contributed about 85% of the anal pressure at rest. During rectal filling, the internal sphincter was observed to relax, the relaxation being preceded in some cases by a brief increase in anal pressure and a burst of EMG activity from the striated muscles. The relaxation of anal pressure during rectal filling was greater after than before pudendal block; the anal pressure at maximal relaxation after pudendal block stabilized around 12 mm of Hg when the rectum was substantially distended. This pressure came entirely from the internal sphincter plus any effect of purely mechanical factors in the anal canal. Thus the activity of striated muscle accounted for the

loss of pressure compared with that (35 mm Hg) before the block. The internal sphincter contributed about 40% of the pressure in the anal canal after sudden substantial distension of the rectum, but accounted for about 65% of the pressure during constant substantial rectal distension. It is concluded that the internal sphincter in the adult is chiefly responsible for anal continence at rest. In the event of sudden substantial distension of the rectum, continence is maintained by the striated sphincter muscles, whereas both sphincter systems probably have an important function during constant distension.

8099 ANALYSES OF SMALL BOWEL PROPULSION, ILEO-CAECAL PASSAGE AND SERUM GASTRIN AFTER TRUNCAL VAGOTOMY. A METHODOLOGICAL STUDY IN THE RAT WITH CONTINUOUS INTRADUODENAL INFUSION. *(E.)* Lundqvist, H.; Jung, B.; Gustavsson, S.; Nilsson, F.; Lundqvist, G. (Dep. Phys. Biol., Gustaf Werner Inst., Uppsala, Sweden). *Acta Chir. Scand.* 141(4):298-303, 1975.

The effect of truncal vagotomy and pyloroplasty on the propagation of $^{51}CrO_4^{2-}$, infused slowly into the duodenum together with a standardized test meal, was studied in fasted male Sprague-Dawley rats. In both vagotomized and control rats, the test solution was infused at a rate of 3.3 µl/min for 5 hr into a tube which had been introduced into the duodenum by duodenotomy. The animals were then killed and the radioactivity in the stomach, small intestine, cecum, and colon was counted with a slit-collimated gamma detector. A mean of about 60% of the total activity in the small intestine was found in large peaks which contained more than 25% of the small intestine activity. These large peaks increased in number towards the distal part of the small intestine and about 61% of the length of the small intestine was virtually free of activity. Small peaks of activity were evenly distributed along the entire length of the small intestine. The vagotomized animals and controls did not differ significantly in terms of peak distribution. The fractional amount of activity in the cecum and colon was also the same in vagotomized and control rats, and the mean transport time between duodenum and cecum was the same. The mean propagation velocity in the first 10% of the small intestine was slow; it was high and constant in the next 30% and then decreased toward the cecum. Again, there were no significant differences between controls and vagotomized animals. The passage from ileum to cecum in the vagotomized rats indicated a uniform process, each discharge containing about 11% of the total administered activity; this implied 2 discharges/hr. Vagotomy resulted in a significant elevation in the serum gastrin level. The results suggest a change in the functional conditions within the ileocecal region after vagotomy. They do not support the hypothesis of incontinence of the ileo-cecal valve after vagotomy.

8100 THE RELATIONSHIP BETWEEN GASTRIC EMPTYING RATE AND PLASMA ENTEROGLUCAGON CONCENTRATION [abstract]. *(E.)* Ralphs, D. N. L.; Bloom, S. R.; Lawson Smith, C.; Thomson, J. P. S. (Middlesex Hosp., London, England). *Gut* 16(5):406, 1975.

8101 THE MECHANISM OF ACTION OF METOCLOPRAMIDE [abstract]. *(E.)* Hay, A. M. (R. Postgrad. Med. Sch., London, England). *Gut* 16(5):403, 1975.

8102 A NEURAL-MEDIATED MYOELECTRIC AND CONTRACTILE RESPONSE TO CHOLERA TOXIN [abstract]. *(E.)* Bertiger, G. (Hosp. of Univ. Pennsylvania, Philadelphia, Pa.). *Gastroenterology* 68(4):1088, 1975.

8103 CANINE TRICHINOSIS: A MODEL TO STUDY CHANGES IN INTESTINAL MOTILITY CAUSED BY ENTERIC PATHOGENS [abstract]. *(E.)* Schanbacher, L. M.; Weisbrodt, N. W.; Castro, G. A. (Univ. Texas Med. Sch., Houston, Tex.). *Gastroenterology* 68(4):981, 1975.

8104 ORGANIZATION OF VAGAL FIBERS TO CONTROL GASTRIC MOTILITY [abstract]. *(E.)* Daniel, E. E.; Sarna, S. K. (Dept. Pharmacol., Univ. Alta., Canada). *Gastroenterology* 68(4):879, 1975.

8105 EFFECT OF THE 1ST 5 CM OF DOUDENUM ON GASTRIC EMPTYING: STUDIES OF ACID, FAT, GLUCOSE AND SYMPATHETIC BLOCKADE [abstract]. *(E.)* Cooke, A. R.; Clark, E. D. (VA Hosp., Iowa City, Iowa). *Gastroenterology* 68(4):877, 1975.

8106 MANOMETRIC PROFILE OF THE INTERNAL ANAL SPHINCTER IN MAN [abstract]. *(E.)* Gutierrez, J. G.; Oliai, A.; Chey, W. Y. (Isaac Gordon Center for Digestive Diseases, Rochester, N. Y.). *Gastroenterology* 68(4):907, 1975.

8107 INFLUENCE OF EXTRINSIC FORCES ON INTRALUMINAL LOWER ESOPHAGEAL SPHINCTER PRESSURE [abstract]. *(E.)* Dodds, W. J.; Miller, W. N.; Hogan, W. J.; Arndorfer, R. C.; Lydon, S. B.; Stef, J. J. (Med. Coll. Wisconsin, Milwaukee, Wis.). *Gastroenterology* 68(4):885, 1975.

8108 RELATIONSHIP BETWEEN INTRALUMINAL PRESSURE AND POTENTIAL DIFFERENCES VARIATIONS IN THE PERFUSED RAT COLON [abstract]. *(E.)* Gerard, J.; Devroede, G.; Postaire, J. G. (Centre Hospitalier Univ., Sherbrooke, Quebec, Canada). *Gastroenterology* 68(4):882, 1975.

8109 ROENTGEN DYMOGRAPHIC INVESTIGATIONS OF GASTRIC PERISTALSIS AFTER INTRAVENOUS INJECTION OF CAERULEIN. *(Ger.)* Szekely, V. A.; Major, T.; Romvari, H. (Innere Abteiling und Rontgenabteilung des Krankenhauses am Tetenyi ut, Budapest, Hungary). *Fortschr. Rontgenstr.* 122(2):167-169, 1975.

8110 STUDY ON THE EFFICIENCY OF ELECTRIC STIMULATION ON THE PELVIC FLOOR. *(Fr.)* Rottembourg, J. L.; Ghoneim, M. A.; Fretin, J.; Susset, J. G. (Centre Hospitalier Universitaire de Sherbrooke, P. Q., Canada). *Biol. Gastroenterol. (Paris)* 8(1):63-72, 1975.

8111 SPONTANEOUS ACTIVITY OF NEURONS IN MYENTERIC PLEXUS OF THE INTESTINE INTACT SEGMENTS IN RABBITS. *(Rus.)* Nozdratchev, A. D.; Katchalov, U. P.; Gnetov, A. V. (Lab. Physiology Vegetative Nervous System, I. P. Pavlov Inst. Physiology, Leningrad, USSR). *Fiziol. Zh.* 61(5):725-730, 1975.

8112 GASTRIC MOTORICITY ACCORDING TO ELECTROGASTROMYOGRAPHIC FINDINGS AFTER PYLORUS-SPARING RESECTION. *(Rus.)* Pantsyrev, Y. M.; Ettinger, A. P. (Dept. Hosp. Surgery, N. I. Pirogov Second Moscow Medical Inst., Moscow, USSR). *Ekspr. Khir. Anesteziol.* (1):27-32, 1975.

8113 GASTROINTESTINAL MOTILITY. *(E.)* Weisbrodt, N. W. (Univ. Texas Medical Sch., Houston, Tex). *Gastrointestinal Physiology*, Vol. 4, edited by E. D. Jacobson and L. L. Shanbour. Baltimore, Md., Univ. Park Press, 1974, pp. 139-181.

8114 EFFECTS OF GLUCAGON (G) AND SECRETIN (S) ON FOOD OR MORPHINE-INDUCED MOTOR ACTIVITY OF THE DISTAL COLON, RECTUM AND ANAL SPHINCTER [abstract]. *(E.)* Chowdhury, A. R.; Lorber, S. H. (Div. Gastroenterol., Temple Univ., Philadelphia, Pa.). *Clin. Res.* 23(3):247A, 1975.

8115 NATURE OF THE VAGAL INHIBITORY INNERVATION TO THE LOWER ESOPHAGEAL SPHINCTER [abstract]. *(E.)* Goyal, R. K.; Rattan, S. (Univ. Texas Health Sci. Cent., Dallas, Tex.). *Clin. Res.* 23(3):249A, 1975.

8116 DIFFERENTIAL MYOELECTRIC AND MOTOR RESPONSES OF THE HUMAN COLON TO NEUROHUMORAL AGENTS [abstract]. *(E.)* Sanpe, W. J.; Carlson, G. M.; Cohen, S. (Univ. Pennsylvania Hosp., Philadelphia, Pa.). *Clin. Res.* 23(3):257A, 1975.

8117 EVIDENCE FOR THE DIRECT INHIBITORY EFFECT OF METHYL METHACRYLATE VAPOR ON GASTROINTESTINAL SMOOTH MUSCLE [abstract]. *(E.)* Tansy, M. F.; Martin, J. S.; Behaim, S.; Landin, W. E. (Temple Univ. Health Sci. Cent., Philadelphia, Pa.). *Clin. Res.* 23 (3):258A, 1975.

8118 THE ADRENERGIC CONTROL OF THE INTERNAL ANAL SPHINCTER IN MAN [abstract]. *(E.)* Gutierrez, J. G.; Shah, A. N. (Genesee Hosp., Rochester, N. Y.). *Clin. Res.* 23(3):250A, 1975.

8119 THE EFFECT OF INTESTINAL WALL TEMPERATURE VARIATIONS ON THE DIGESTIVE MOTILITY IN THE NON-ANAESTHETIZED DOG. *(Fr.)* Santini, R.; Laugier, C.; Brard, E. (I.N.S.A., 20 Ave. A. Einstein, 69621 Villeurbanne, France). *C. R. Soc. Biol. (Paris)* 169 (2):338-344, 1975.

8120 COLONIC SPHINCTER IN THE RAT. *(Ger.)* Werner, B. (Anatomisches Institut der Universitat Hamburg, Hamburg, BRD). *Acta Anat. (Basel)* 91(3):321-329, 1975.

8121 GASTRIC AND COLONIC MOTILITY DURING EXPERIMENTAL CONFLICTS IN PSYCHOSOMATIC PATIENTS. *(It.)* Trombini, G.; Lanfranchi, G. A. (Ist.di Psicologia e Clinica Med. II, dell' Universita di Bologna, Italy). *Med. Psicosomatica* 19(2): 151-172, 1974.

8122 INFLUENCE OF SULFHYDRYL REAGENTS AND COMPOUNDS ON THE CONTRACTILE RESPONSE TO ACETYLCHOLINE IN ISOLATED RAT SMALL INTESTINE. *(E.)* Takasaki, K.; Kiramine, Y. (Daiichi Coll. Pharmaceutical Sciences, Fukuoka, Japan). *Kurume Med. J.* 21(4):91-100, 1974.

8123 INFLUENCE OF TETRODOTOXIN ON THE CONTRACTILE RESPONSE OF THE SMALL INTESTINE OF GUINEA-PIG PRODUCED BY PICRIC ACID AND ACETYLCHOLINE. *(E.)* Takasaki, K.; Ogata, H. (Daiichi Coll. Pharmaceutical Sciences, Fukuoka, Japan). *Kurume Med. J.* 21(4): 101-109, 1974.

8124 INVESTIGATION OF CHANGES IN THE INTRAGASTRIC PRESSURE BY MEANS OF A SEMICONDUCTOR TENSOMETRIC MEMBRANE. *(Cz.)* Enderle, E.; Pallova, S. (Interni katedra ILF, Praha 4, Budejovicka 800, Czechoslovakia). *Cesk. Gastroenterol. Vyz.* 29(3):195-198, 1975.

8125 EFFECT OF SULPIRIDE ON INTESTINAL MOTILITY. *(It.)* Marone, G.; Lobello, R.; Marzano, L. A.; Colantuoni, A. (Seconda Facolta Medicina Chirurgia, Universita Napoli, Italy). *Boll. Soc. Ital. Sper.* 50(23):2074-2079, 1974.

8126 STUDIES ON PHOSPHOLIPIDS IN SMALL INTESTINAL SMOOTH MUSCLE. I. ON COMPOSITION AND METABOLISM OF PHOSPHOLIPIDS IN SUBCELLULAR FRACTIONS FROM RAT SMALL INTESTINAL SMOOTH MUSCLE. *(Jpn.)* Minakawa, K. (Dept. Surgery, Section 1, Sapporo Medical College). *Sapporo Igaku Zasshi* 43(2):87-89, 1974.

8127 STUDIES ON PHOSPHOLIPIDS IN SMALL INTESTINAL SMOOTH MUSCLE. II. ON EXCHANGE OF PHOSPHOLIPIDS BETWEEN MITOCHONDRIA AND MICROSOMES IN RAT SMALL INTESTINAL SMOOTH MUSCLE. *(Jpn.)* Minakawa, K. (Dept. Surgery, Section 1, Sapporo Medical College). *Sapporo Igaku Zasshi* 43(2):98-103, 1974.

8128 BIOPOTENTIALS OF THE SMOOTH MUSCLES AND CONTRACTILE ACTIVITY OF THE DUODENUM. *(Rus.)* Ustinov, V. N. (I. P. Pavlov Inst. Physiology, Leningrad, USSR). *Fiziol. Zh. SSSR* 61(7):1060-1068, 1975.

See also, 8192, 8435, 9352.

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8129 STUDIES OF INTESTINAL LYMPHOID TISSUE. II. ASPECTS OF PROLIFERATION AND MIGRATION OF EPITHELIAL LYMPHOCYTES IN THE SMALL INTESTINE OF MICE. *(E.)* Marsh, M. N. (Southampton Univ. Sch. Med., England). *Gut* 16(9):674-682, 1975.

The proliferation and migration of epithelial lymphocytes in the adult mouse jejunum were studied in animals of the Charles River strain. Some animals were given 6 consecutive i.p. injections of ^{3}H-methyl-thymidine (^{3}H-Tdr, 25 µCi) at hourly intervals, and killed 6-168 hr after the first injection. Other animals received 1-4 i.p. injections of demecolcine (250 µg) and were killed 1 hr after the last injection. Segments of upper jejunum from both groups were fixed with chrome-osmium, embedded in Epon, and examined as in abstract 8003 in this issue. Label was confined predominantly to the medium-sized epithelial lymphocytes, and virtually all of the labeled lymphocytes observed in transit across the basement membrane were of the same variety. Spontaneous mitotic figures in the epithelial lymphocytes were observed in about 1-2/1000 epithelial cell nuclei. The density of immunoblasts (labeled and unlabeled) was on the order 3/1000 nuclei. ^{3}H-Tdr treatment was followed by 2 peaks of labeling occurring between 6 and 60 hr and between 72 and 168 hr. The maxima occurred at 24 hr and 144 hr, with the proportion of labeled lymphocytes at these times being approximately 25% and 35%, resp. Between 60 and 96 hr there was a rapid decrease in the total population of epithelial lymphocytes, the rate of fall being about 3 cells/1000 epithelial cell nuclei/hr. The epithelial cells did not migrate along the villi but circulated rapidly through the epithelium. Within the mucosal lymphatics, 74.4% of the lymphocytes were small (less than 7 µm in diameter), 19.3% were medium-sized (7-10 µm in diameter), and 6.3% were large (greater than 10 µm in diameter. In contrast, 25% of the medium-sized lymphocytes and 38% of the large cells were labeled, compared with only 3.5% of the small lymphocytes. These lymphocytes also exhibited a biphasic pattern of labeling, with a decrease in number occurring between 48 and 80 hr. After demecolcine treatment, epithelial lymphocyte mitosis occurred at a rate of about 1/100 lymphocytes/hr. The overall lymphoid cell population per villus was about 840, with about 9 of these epithelial lymphocytes dividing hourly. Consequently, epithelial lymphocytes must leave the epithelium at a similar rate, or their density within the villous epithelium would increase progressively. These results suggest that the epithelial lymphocytes may directly enter the adjacent lymphatics, thereby gaining access to the thoracic duct lymph.

8130 EFFECT OF MICROFLORA ON THE FREE AMINO ACID DISTRIBUTION IN VARIOUS REGIONS OF THE MOUSE GASTROINTESTINAL TRACT. *(E.)* Whitt, D. D.; Demoss, R. D. (Dept. Microbiology, Univ. Illinois, Urbana, Ill. 61801). *Appl. Microbiol.* 30(4):609-615, 1975.

The distribution of free amino acids in various regions of the gastrointestinal tract (stomach, upper small intestine, lower small intestine, cecum, upper colon, and lower colon) was studied in germfree and conventionalized Charles River mice. Particular emphasis was placed on the conversion of tryptophan to indole as a probe for studying intermicrobial and microbe-host interactions *in vivo*. Large differences were observed in the free amino acid content of the various regions of the digestive tract in each type of mouse and also in any one region between germfree and conventionalized mice. Concentrations of arginine, threonine, serine, glutathione, tyrosine and tryptophan were higher in the germfree mice. Free amino acid concentrations in the upper half of the small intestine were similar in both types of mice and were much greater than in the stomach. A pronounced effect of microflora on free amino acid composition was first observed in the lower small intestine. While the concentrations of free amino acids in the lower small intestine of the conventionalized mice were the same as in the upper small intestine, the concentrations in the lower small intestine of the germfree mice were three-fold lower than in the upper small intestine. Overall, free amino acid concentrations in the cecum and colon were similar and were essentially the same in both types of mice. However, significant amounts of indole were found in the cecum and upper and lower colon of conventionalized mice. The data indicate that the changes in free amino acid content and distribution produced by microflora are great enough to serve as a probe for studying the interactions of a limited number of species of microbes in gnotobiotic animals and to assign probable specific functions to each species. The results also demonstrate the feasibility of using the metabolic conversion of tryptophan as a probe for studying microbial interactions and microbe-host interactions.

8131 COMPARISON OF THE ADAPTIVE CHANGES IN DISACCHARIDASE, GLYCOLYTIC ENZYME AND FRUCTOSEDIPHOSPHATASE ACTIVITIES AFTER INTRAVENOUS AND ORAL GLUCOSE IN NORMAL MEN. *(E.)* Greene, H. L.; Stifel, F. B.; Hagler, L.; Herman, R. H. (Vanderbilt

Univ. Sch. Medicine, Nashville, Tennessee 37232). *Am. J. Clin. Nutr.* 28(10):1122-1125, 1975.

This study compared the adaptive changes in disaccharidase, glycolytic enzyme and fructosediphosphatase activities after p.o. and i.v. administration of glucose in human volunteers. Seven healthy adult men (aged 18-24 yr) were fed a 3,000 kcal defined liquid formula diet daily for 19 days. Except for one five-day period, 50% of the total caloric intake was provided as either p.o. or i.v. glucose. The study was divided into four periods as follows: period 1 lasted five days and provided 50% of calories as glucose; period 2 lasted five days and provided no carbohydrate (70% fat and 30% protein); period 3 lasted four days and provided 50% of calories as i.v. glucose and 50% of calories as p.o. fat plus protein; period 4 lasted five days and provided 50% of calories as p.o. glucose. Intestinal biopsy specimens were taken on the third and fifth days of periods 1, 2, and 4, and on the fourth day of period 3. All biopsies were performed with the adult Crosby-Kugler intestinal biopsy capsule. Histologic examination by light microscopy and enzyme measurements were done on each biopsy specimen. No change in intestinal morphology occurred during the study. The carbohydrate-free diet caused the alpha-glucosidase (maltase and sucrase) activities to decrease significantly from that seen with the glucose diet. Sucrase decreased from approximately 14.4 to 7.1 μM/min/g tissue and maltase decreased from approximately 56.1 to 30.0 μM/min/g tissue. Glycolytic enzyme activities decreased during the carbohydrate-free period: pyruvate kinase from approximately 236 to 78 μM/min/g protein; fructose 1-phosphate aldolase from 147 to 53 μM/min/g protein; fructose-1,6-diphosphate aldolase from 151 to 55 μM/min/g protein; and hexokinase from 21 to 7 μM/min/g protein. I.v. glucose caused no change in disaccharidase activities. The enzyme activities during periods 1 and 4 were identical and significantly higher than during period 2 with the exception of fructose-1,6-diphosphatase, which increased during period 2 as compared with periods 1 and 4. These findings provide an explanation for the transient period of decreased tolerance to dietary sugars when patients are weaned from total parenteral feedings to enteral feedings.

8132 SEX DIFFERENCES IN ANTRAL AND SERUM GASTRIN CONCENTRATION IN THE RAT [abstract]. *(E.)* Lichtenberger, L. M.; Nance, D. M.; Gorski, R. A. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gastroenterology* 68(4):935, 1975.

8133 DISAPPEARANCE HALF-TIME OF EXOGENOUS CHOLECYSTOKININ FROM CIRCULATION IN MAN AND DOGS [abstract]. *(E.)* Rayford, P. L.; Fender, H. R.; Ramus, N. I.; Thompson, J. C. (Univ. Texas Med. Branch, Galveston, Tex.). *Gastroenterology* 68(4):971, 1975.

8134 ROLE OF PITUITOADRENAL FUNCTION IN THE REGULATION OF SERUM GASTRIN LEVELS IN RATS [abstract]. *(E.)* Tateishi, H.; Onishi, T.; Nomiyama, S.; Nakao, E.; Majima, S. (Kyoto Prefectural Univ. Med., Kyoto, Japan). *Gastroenterology* 68(4): 996, 1975.

8135 BIOCHEMICAL ACTIVITY OF TRYPSIN COMPLEXED WITH ANTIBODY [abstract]. *(E.)* Rinderknecht, H.; Carmack, C.; Geokas, M. C. (Sepulveda VA Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):899, 1975.

8136 METIAMIDE AND PROSTAGLANDIN E_1 INHIBITION OF PENTAGASTRIN STIMULATED ACID SECRETION [abstract]. *(E.)* Charters, A. C.; Brown, B. N.; Orloff, M. J. (Dept. Surg., Univ. California, San Diego, La Jolla, Calif.). *Gastroenterology* 68(4): 872, 1975.

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Stomach

8137 SOMATOSTATIN: ABUNDANCE OF IMMUNOREACTIVE HORMONE IN RAT STOMACH AND PANCREAS. *(E.)* Arimura, A.; Sato, H.; Dupont, A.; Nishi, N.; Schally, A. V. (Tulane Univ. Sch. Medicine, New Orleans, La. 70112). *Science* 189(4207):1007-1009, 1975.

An antiserum to synthetic somatostatin was prepared and a radioimmunoassay system, which allows displacement of (^{125}I-Tyr)somatostatin by unlabeled hormone, was utilized to study concentrations of the hormone in various adult female rat organs (Charles River, DC strain). Heart, liver, lungs, thymus, spleen, kidneys, adrenals and ovaries had no significant levels, while pancreas (33.8 pg/μg of protein) and stomach (11.7 pg/μg of protein) had levels such that total amount in either organ was greater than that in the hypothalamus. Purification on a Sephadex G-25 column and elution with 0.2 N acetic acid allowed two immunoreactive peaks to be identified. Pancreatic extract, as well as that from stomach, contained both

peaks, but that associated with big somatostatin predominated in pancreas and that associated with small somatostatin predominated in the stomach. This study suggests that the pancreas and the stomach may synthesize somatostatin, or an immunoreactively similar hormone, which might play a role in the secretory activities of these organs.

8138 HUMAN GASTRIC MUCOSAL ZYMOGEN GRANULES. *(E.)* Mangla, J. C.; Lillibridge, C. B.; Navab, F.; Turner, M. D. (Monroe Community Hosp., Rochester, N.Y.). *Biochem. Med.* 13(2):184-191, 1975.

The proteinase composition of zymogen granules isolated from the fundic glands of human gastric mucosa was examined with electrophoretic techniques. The tissue was obtained from a patient undergoing resection for duodenal ulcer, and additional gastric and esophageal biopsies were obtained from a patient with reflux esophagitis. The tissues were also examined histopathologically. The gastric tissue from the first patient was homogenized and separated by differential centrifugation into 6 fractions: nuclei and cell debris (B); supernatant (C); zymogen granules (D); supernatant (E); 'mitochondria' (F); and supernatant (G). Although all fractions contained some activity, proteolytic activity was highest in the zymogen granule fraction D. The presence of some activity in fractions E, F, and G may be due to breakage of zymogen granules. Agar gel electrophoresis showed that cathepsin was present in fractions B, E, and G, but not in fraction D. The esophageal biopsy specimens contained only cathepsin bands on agar gel electrophoresis, while the gastric biopsy specimens contained all gastric mucosal proteases. The data indicate that cathepsin does not originate in chief cells containing zymogen granules; it may be associated with or a product of the mucus cell.

8139 CHARACTERISTICS OF GASTRIC INHIBITION BY ACIDIFICATION OF OXYNTIC GLAND AREA. *(E.)* Konturek, S. J.; Obtulowicz, W.; Tasler, J. (Medical Acad., Cracow, Poland). *J. Physiol.* 251(3):699-709, 1975.

The nature of the fundic feedback inhibition of acid secretion in response to a peptone (liver) meal and to i.v. histamine (160 µg/kg/hr), pentagastrin (8 µg/kg/hr) and Urecholine (100 µg/kg/hr) was studied in dogs with Heidenhain pouches, gastric fistulas, and pancreatic fistulas. The liver meal (pH 5.0-1.0) was introduced into the Heidenhain pouch; in some cases, the pouch was irrigated with 2% xylocaine solution (50 ml) or 2% atropine solution (50 ml) prior to the introduction of the test meal, or atropine (100 µg/kg/hr), metiamide (2.9 mg/kg/hr), or secretin (4 µg/kg/hr) was injected i.v. prior to the introduction of the meal. The gastric acid secretion responses were measured using the intragastric titration method and by monitoring the rate at which a solution of 1.0 N NaOH had to be added to maintain the pH of the gastric contents at a predetermined value. At pH 5.0, the liver extract meal produced a potent and pressure-related stimulation of acid secretion from the Heidenhain pouch without any change in secretion from the main stomach and pancreas or in the serum immunoassayable gastric concentration. Reduction of the pH below 5.0 resulted in a pH-dependent inhibition of gastric acid output, which at pH 1.0 was only about 30% of the value at pH 5.0. Acid secretion from the pouch induced by histamine, pentagastrin, and Urecholine also showed a gradual decrease when the pH of the pouch contents was decreased from 5.0 to 1.0. This pH-dependent inhibition was accompanied by an increase in pepsin secretion. The pH-dependent inhibition of the Heidenhain pouch response to the liver extract meal was not altered by topical xylocaine or atropine or by i.v. atropine, metiamide, or secretin, all of which caused a marked inhibition of the main stomach response to the liver meal. The results indicate that there is a local and gastrin-dependent inhibition mechanism of gastric acid secretion that is activated by an acidified meal making contact with the oxyntic gland area.

8140 RELEASE OF GASTRIN ON VAGAL STIMULATION IN THE CAT. *(E.)* Uvnas, B.; Uvnas-Wallensten, K.; Nilsson, G. (Dept. Pharmacology, Karolinska Institutet, Stockholm, Sweden). *Acta Physiol. Scand.* 94:167-176, 1975.

An attempt was made to obtain quantitative information concerning gastrin output by simultaneously recording gastric blood flow and gastrin concentrations in the gastric and/or the peripheral venous blood. The experiments were performed on 30 cats (2-4 kg), fasted for 18 hr and anesthetized with chloralose-urethane (50 and 100 mg/kg, i.v.). Blood pressure was recorded in one of the femoral arteries. The intestine below the duodenum was removed. To allow sampling of antral gastrin, the portal vein was ligated close to its bifurcation (i.e., above the entrance of the antral venous blood) and a polyethylene catheter was inserted into the blind end of the superior mesenteric vein. During each experiment, the catheter was continuously perfused with warm water (38 C) and isotonic 0.15 M phosphate buffer solution (pH 7.4) at a rate of 5 ml/min. The cervical vagal nerves were ligated or cut and covered with paraffin oil or plastibase to prevent drying. The distal ends of the nerves were stimulated supramaximally with a Grass stimulator (S 88) delivering 7 V, of three to five min duration, and 1 to 20 Hz. The effects on heart rate and blood pressure following stimulation were taken as evidence of vagal activation. In certain experiments, gastric secretion was collected each 15 min. The continuous recording of gastric blood flow allowed quantitative calculations of the gastrin output to be made. Hematocrit values for blood from ten cats varied from 35 to 56 (average, 42.5). The basal gastrin output/min was calculated from three to five gastrin blood samples taken during 30 min and from the concomitant gastric blood flow. Basal peripheral gastrin levels averaged 65 pg/ml and basal portal levels 225 pg/ml. On unilateral vagal stimulation with frequencies above 3 to 4 Hz, gastrin release rapidly increased, reaching a peak within 5 to 10 min. In spite of continued stimulation and independent of frequency, the gastrin levels declined and returned to basal

values after a total of 2 to 3,000 stimuli. A new maximal response could be induced after a recovery period of 15 to 30 min. In the same cat stimulation of either the left or the right vagus released equal maximal amounts of gastrin (average 32,000 pg). The maximal gastrin output on vagal stimulation corresponds to less than 1% of the total content of antral gastrin determined with radioimmunoassay. It is concluded that since the basal gastrin values fluctuate by about 30%, the technique presented in this paper will not allow one to record the low gastrin output which can be expected on unilateral vagal stimulation with frequencies below 4 Hz.

8141 GASTRIC ACID RESPONSES TO GRADED VAGAL STIMULATION IN THE ANAESTHETIZED CAT. *(E.)* Sjodin, L. (Dept. Pharmacology, Karolinska Institutet, Stockholm, Sweden). *Digestion* 12(1): 17-24, 1975.

The relationship between stimulation frequency and acid response in 45 anesthetized cats with intact or resected gastrin-releasing regions was studied. The vagus was isolated in the neck and placed on bipolar silver electrodes connected to a monophasic square wave impulse generator with impulse strength of 4 V and duration of 5 msec. The stomach was cannulated and isolated through an abdominal incision, and acid output measured by titration to pH 7. In cats with intact antrum and duodenum, graded acid responses occurred with frequencies of 0.5-8 Hz, with maximal secretion at 4-8 Hz. Acid output in antrectomized cats was lower at all frequencies, but not significantly. Significantly lower acid outputs occurred at all frequencies in cats with resected antrum and duodenum. Antrectomized cats, infused i.v. with crude gastrin extracts (0.3-2.7 g wet hog antral mucosa/kg/hr) having no effect alone, responded to vagal stimulation of 1-4 Hz as did cats with intact antrum. Antrectomized cats receiving higher doses of gastrin (0.3-7.6 g wet mucosa/kg/hr) had greater responses to low frequency stimulation (0.5-1 Hz) than did cats with intact antrum. Thus, graded acid secretion occurs in response to increased stimulation frequency from 0.5-8 Hz with maximal response at 4-8 Hz. Antrectomy reduces acid response to low frequency stimulation, and duodenal resection causes a greater reduction.

8142 ROLE OF ANTRUM AND DUODENUM IN THE CONTROL OF POSTPRANDIAL GASTRIC ACID SECRETION AND PLASMA GASTRIN CONCENTRATION IN DOGS. *(E.)* Sjödin, L.; Nilsson, G. (Dept. Pharmacology, Karolinska Institutet, S-104 01 Stockholm 60, Sweden). *Gastroenterology* 69(4):928-934, 1975.

Secretion of basal and postprandial gastrin and acid was studied in three mongrel dogs with vagally innervated fundic pouches (Pavlov type) preoperatively and after antrectomy with gastroduodenostomy, then after resection of the duodenal bulb with gastroduodenostomy. Basal pouch secretion was collected for four 15-min periods after an 18-hr fast. A 250 g minced boiled beef liver meal with 250 g water was fed the animals, then gastric secretions were collected for 3 hr, and five samples at 2 min intervals and two at 5 min intervals were collected from a leg vein for gastrin determinations. Histamine was infused i.v. as the dihydrochloride at 0.25 to 8 mg/hr to determine acid response after each operation. Basal levels of gastrin following antrectomy (65, 39, and 15 pg/ml) were essentially unchanged from preoperative levels (63, 46, and 21 pg/ml), while bulb resection reduced levels significantly (42, 24, and 3 pg/ml). Removal of the duodenal bulb resulted in no postprandial elevation of serum gastrin. Peak postprandial acid response was 59, 188 and 191% of maximal response to histamine. Following antrectomy, three-hr outputs were 147, 28 and 48% higher than pre-operative levels. Duodenal bulb resection reduced the postprandial acid secretion to or below preantrectomy values. This study shows that antrectomy does not significantly alter basal gastrin secretion, suggesting that there may be mechanisms regulating basal levels. Following duodenal bulb resection, basal levels were reduced, suggesting that this regulation is limited to the bulbar mucosa. This study also demonstrates an increase in gastric acid following antrectomy, supporting the concept that low levels of gastrin are sufficient to permit vagal stimulation of acid output, but it may also suggest that antrectomy eliminated an antral mechanism which limits postprandial acid secretion. Resection of the bulb reduced acid output, but only to preoperative levels, which suggests a possible acid secretion-inhibitory mechanism in the bulb as well as a stimulatory mechanism.

8143 TITRATION OF SODIUM CHANNELS IN CANINE GASTRIC MUCOSA. *(E.)* Kauffman, G. L., Jr.; Thompson, M. R. (Dept. Physiology, Univ. Michigan, Ann Arbor, Mich. 48104). *Proc. Natl. Acad. Sci.* 72(9):3731-3734, 1975.

Net Na^+ flux from mucosa to lumen, potential difference, and volume and plasma protein output were measured in vagally denervated, separated pouches of the canine oxyntic or pyloric glandular mucosa when the pouches were irrigated with Na^+-free solutions whose pH ranged from 1.5 to 12.2. The apparent permeability to Na^+ (P'_{Na}) was then calculated. The P'_{Na} was lowest when the mucosa was bathed with acid and increased two- to three-fold when the pH was raised to 10. In the pH range 10.0 to 11.2, the P'_{Na} was greater by an order of magnitude, but the volume output was small and no plasma proteins were shed. When the pH was raised above 11.2, there was an abrupt increase in P'_{Na} and the mucosa shed a large volume of fluid containing plasma proteins. The change effected by raising the pH to 10.0 to 11.2 occurred within ten sec, and was reversible. The change effected by raising the pH above 11.2 also occurred within ten sec, but was only partially reversible. These data are consistent with the idea that the channels through which Na^+ diffuses from the gastric interstitial fluid into the lumen are dominated by ionizable groups having an apparent pK_a in the range 10.5 to 11.5.

8144 RADIOTELEMETRIC TITRATION OF GASTRIC JUICE AND ALCOHOL ABSORPTION. *(Ger.)* Weinel, H.; Wolters, P.; Kruse-Jarres, J. D. (78 Freiburg, Hugstetter Strasse 55, Germany). *Med. Klin.* 69(50): 2067-2070, 1974.

The relation between alcohol absorption and gastric secretion was studied in 11 normal subjects (6 males and 5 females) for 90 min after ingestion of 1.05 g/kg of alcohol over a period of 10 min or less. Blood alcohol concentrations were measured continuously in an Auto-Analyzer using alcohol dehydrogenase and a spectrophotometric method, and gastric juice was titrated in the stomach with 1 M potassium bicarbonate and the use of a radio transmitter placed in the stomach. Gastric acid was titrated under basal conditions and after maximal stimulation by i.v. infusion of 6 μg/kg/hr of pentagastrin. One subject who had pathologically high blood alcohol concentrations but who was asymptomatic was not included in the statistical analysis. A close inverse correlation was found between gastric acid secretion after maximal pentagastrin stimulation and the rate at which blood alcohol concentrations increased up to 45 min after ingestion of alcohol was begun. After 75 min the correlation was no longer significant since alcohol absorption was then affected more by processes occurring outside the stomach. These findings explain why alcohol absorption is decreased in hyperchlorhydria, increased in subjects with atrophic gastric mucosa, and increased in alcoholics if they have alcohol-induced atrophic gastritis. Reduced tolerance to alcohol following stress situations can be attributed to decreased gastric secretion following an initial increase during stress so that ingested alcohol is diluted less than normal and is more rapidly absorbed. Increased alcohol absorption in gastrectomized patients is due both to decreased gastric secretion and increases in the rate at which the stomach empties.

8145 DISTRIBUTION OF INTRAVENOUS SODIUM ACETYLSALICYLATE IN THE UNANAESTHETIZED RAT ON STIMULATION AND INHIBITION OF GASTRIC SECRETION. *(E.)* Frenning, B.; Flemstrom, G. (Dep. Med., Univ. Uppsala, Sweden). *Scand. J. Gastroenterol.* 10(5):465-469, 1975.

The effect of the rate of gastric acid secretion on the mucosal concentration of salicylate was studied in fasted male albino rats 1 hr after the i.v. injection of carboxyl-^{14}C acetylsalicylate (20 or 40 mg/kg). Histamine (50 mg/kg) or atropine (15 mg/kg) was injected s.c. to stimulate or inhibit gastric acid secretion. ^{14}C activity in specimens of gastric mucosa, liver, kidney, and muscle was determined by liquid scintillation counting. Histamine increased the acidity but did not affect the volume of gastric secretion from the stomachs of pylorus-ligated rats; atropine decreased both the volume and acidity of the secretion. Histamine, but not atropine, lowered the sodium ion concentration and raised the chloride ion concentration in the secretion. The concentration of salicylate 1 hr after injection of the labeled drug was lowest in the muscle and gastric mucosa and highest in the blood and kidneys. The distribution of salicylate in these tissues was not altered by histamine or atropine treatment, and the salicylate concentration was proportional to the amount of salicylate injected in all tissues examined. Thus, the secretory state of the gastric mucosa did not affect the concentration of salicylate in this tissue when the drug was administered i.v.

8146 POTENTIAL HISTAMINE H_2-RECEPTOR ANTAGONISTS. 2. N^{α}-GUANYLHISTAMINE. *(E.)* Durant, G. J.; Parsons, M. E.; Black, J. W. (Smith, Kline and French Ltd., Welwyn Garden City, Hertfordshire, England). *J. Med. Chem.* 18(8):830-833, 1975.

The present study is part of a program aimed at the discovery of compounds that could specifically antagonize certain pharmacological actions of histamine that are not blocked by conventional antihistaminic drugs, e.g., pyrilamine. Converting the side-chain amino group of histamine into a guanidine yielded the first histamine H_2-receptor antagonist, N^{α}-guanylhistamine. N^{α}-guanylhistamine, as its sulfate salt, was tested for interactions with histamine H_2-receptors *in vivo* on gastric acid secretion using the lumen-perfused stomach of the anesthetized rat preparation. Stimulant activity was found at doses in the range of 16 to 512 μM/kg, given by rapid i.v. injection. The maximal response obtained with guanylhistamine was between 50 and 60% of that obtainable with histamine. Agonist potency, which was assessed by comparison of the doses of N^{α}-guanylhistamine and histamine required to produce equal acid secretory responses, was found to be less than 0.5% of histamine (n = 9). Guanylhistamine is therefore a weak agonist on gastric acid secretion. To test for antagonist activity, N^{α}-guanylhistamine was injected i.v. after a plateau of secretion had been established to an i.v. infusion of histamine. When first tested, the rate of histamine influence used (0.05 μM/kg/min) produced a secretory response which was less than 50% of maximum and guanylhistamine caused either no effect or a slight further increase in acid secretion. However, when N^{α}-guanylhistamine was tested against a near-maximal secretory response to histamine (infusion rate 0.25 μM/kg/min), inhibition was detected at doses of 256 μM/kg and greater. The approximate i.v. ID_{50} (that is, the dose to produce 50% inhibition of near-maximal secretion) was calculated to be 800 μM/kg (n = 15). The compound was further investigated on isolated guinea pig atrium *in vitro*, where histamine causes an increased rate of beating by interaction with histamine H_2-receptors. Using cumulative dose-response curves, N^{α}-guanylhistamine was found to have agonist activity at high concentrations up to 5 μM, but only achieved 60 ± 5% (n = 7) of the maximal response obtainable with histamine and the dose-response curves were not parallel. This behavior is typical of a partial agonist and, because of nonparallelism, only an approximate activity relative to histamine of 0.7% could be estimated. Guanylhistamine was also tested for interactions with histamine H_1-receptors on the isolated guinea pig ileum. No agonist activity was detected at doses up to 1 μM (i.e., potency smaller than 0.01% histamine; n = 4). However, guanylhistamine had a weak antagonist ac-

tion against histamine on the guinea pig ileum, giving a pA_2 value of approximately 3.8 (n = 5). It is concluded that although guanylhistamine behaves as a partial agonist at histamine H_2-receptors, the structure of this weakly active antagonist provides a vital lead for the design of highly active and clinically effective H_2-receptor antagonists.

8147 INFLUENCE OF ATROPINE, METIAMIDE AND VAGOTOMY ON cAMP OF RESTING AND STIMULATED GASTRIC MUCOSA. *(E.)* Ruoff, H. J.; Sewing, K. F. (Dept. Pharmacology, Univ. Tubingen, Tubingen, West Germany). *Eur. J. Pharmacol.* 32:227-232, 1975.

The effects of atropine, metiamide, and truncal vagotomy on the cyclic AMP (cAMP) levels of the gastric mucosa (resting or stimulated) was studied in normal Wistar rats. To stimulate the mucosa, rats were pretreated with histamine, pentagastrin, carbachol or insulin. In vagotomized rats, gastric mucosa levels were investigated under basal conditions and after insulin. Gastric mucosal cAMP was determined by a protein binding assay. To test the influence of atropine (1 mg/kg) or metiamide (3 mg/kg) on resting and stimulated gastric mucosa, four combinations were necessary: saline-saline, inhibitor-saline, saline-stimulant, and inhibitor-stimulant. The rats were killed at the time of maximum cAMP concentration: 30 to 45 min after histamine, 45 min after pentagastrin, and 15 and 90 min after carbachol or insulin. Tests for cAMP were begun four to 20 weeks after truncal vagotomy. In rats treated with atropine, the mean gastric mucosal cAMP level ranged from 0.56 to 0.79 pM cAMP/mg wet weight and from 0.60 to 0.71 pM in the saline-treated animals. Atropine had no significant influence on the cAMP concentration of resting gastric mucosa. Gastric mucosal cAMP levels were significantly raised by histamine, pentagastrin, carbachol and insulin when compared with the saline-treated control groups. Atropine was unable to prevent the gastric mucosal cAMP peaks caused by these four gastric secretagogues. The mean cAMP values of the six saline-treated control groups ranged from 0.66 to 0.76 pM/mg. No effect of metiamide on cAMP levels of the resting mucosa was observed in any of the six groups. All stimulants produced a significant increase in cAMP concentration. The only exception was at 90 min after carbachol when the cAMP level was not statistically significant from that of the controls. In contrast to atropine, metiamide blocked the histamine- and pentagastrin-mediated cAMP rise completely. No inhibiting effect of metiamide was found when carbachol or insulin were used as stimulants. Neither of the two consecutive cAMP peaks of the stimulants were influenced by metiamide. Gastric mucosal cAMP levels of vagotomized rats were significantly elevated four and 20 weeks after the operation in comparison to sham-operated animals. Insulin stimulation, which normally raised gastric mucosal cAMP levels, failed to do so in vagotomized animals. It was concluded that reduction of gastric secretion is not necessarily associated with a suppression of the gastric mucosal rise and that the *in vivo* rise of gastric mucosal cAMP after carbachol or insulin was not due to direct cholinergic action. From the spectrum of metiamide inhibitory actions, it was suggested that the increased gastric mucosal cAMP concentration after histamine and pentagastrin administration is mediated by H_2-receptor stiumlation.

8148 INHIBITORY ACTION OF METIAMIDE ON GASTRIC SECRETION INDUCED BY BOMBESIN AND CAERULEIN. *(E.)* Bertaccini, G.; Impicciatore, M.; Chiavarini, M. (Inst. Pharmacology, Univ. Parma, Parma, Italy). *Farmaco Ed. Sci.* 30(6):498-504, 1975.

Metiamide, the prototype of a new class of histamine H_2-receptor antagonists, was studied to determine if it could counteract the stimulant effect of bombesin, a tetradecapeptide, and hence, that of endogenous gastrin. Experiments were carried out on six mongrel dogs with gastric fistulas and Heidenhain pouches drained to the surface by metal cannulas, and on four cats with gastric fistulas only. They were administered bombesin (doses varied between 0.065 to 2 µg/kg/hr) by i.v. infusion, and metiamide either by single i.v. injection at the time of maximum hypersecretion or by continuous infusion starting together with that of the bombesin. Doses of metiamide varied from 1 to 10 mg/kg. The animals treated with bombesin alone acted as controls. In some experiments, atropine (0.2 mg/kg, s.c.) was given instead of metiamide. Gastric juice was collected from the Heidenhain pouch and the gastric fistula by gravity drainage and was separated into 15 min or 30 min samples. Gastric hypersecretion was evoked by continuous i.v. infusion of cerulein (2 µg/kg/hr). Metiamide was administered by a single i.v. injection (5 mg/kg), after 30 to 60 min of infusion, when a plateau was reached which exceeded the basal levels of secretion by 200 to 250%. In the dog, metiamide administered together with bombesin strongly inhibited the hypersecretion induced by the peptide at doses of 2.5 mg/kg. The inhibition was of noncompetitive type and the maximal effect of bombesin, observed after infusion of 1 µg/kg/hr, was reduced by approximately 75%. When metiamide was injected at the time of maximum hypersecretion induced by bombesin (1 µg/kg/hr), it provoked good inhibition at doses of 1 and 2.5 mg/kg and an almost complete block with return to pre-infusion (i.e. basal) levels, at the dose of 5 mg/kg. The degree of inhibition was approximately the same for the acid secretion from both the main stomach and the Heidenhain pouch. The rise in plasma levels of radioimmunological gastrin induced by bombesin was not modified by administration of metiamide. Atropine was also ineffective in modifying plasma levels of gastrin. The inhibitory effect of metiamide on the hypersecretion induced by bombesin paralleled that observed in the dog. There was only a small quantitative difference inasmuch as the virtual block of gastric secretion was induced by 10 mg/kg and not by 5 mg/kg as observed in the dog. The effect of metiamide in rats was rather erratic, but in the bulk of the experiments metiamide caused a 30 to 50% reduction of the acid secretion. The authors conclude that clinical trials would be necessary to check the possibility of the practical use of metiamide in diseases connected with gastric hypersecretion.

8149 DISPLACEMENT BY METIAMIDE OF THE DOSE-RESPONSE CURVES TO PENTAGASTRIN AND METHACHOLINE IN THE CONSCIOUS RAT. *(E.)* Lundell, L. (Inst. Physiol., Univ. Lund, Sweden). *Br. J. Pharmacol.* 54:507-509, 1975.

The effects of a specific histamine H_2-receptor antagonist, metiamide (50 or 500 μg/hr, infused i.v.), on the acid dose-response curves for pentagastrin (0-64 μg/hr, infused i.v.), and methacholine (0-128 μg/hr, infused i.v.) were studied in fasted female Sprague-Dawley rats with Heidenhain pouches. Metiamide infusion was begun 1 hr before pentagastrin or methacholine infusion, the latter drugs being infused for 90 min in stepwise increasing dosages. Gastric juice was collected in 30-min samples. The mean basal interdigestive secretion was 2.4 μEq/30 min. Increasing doses of pentagastrin produced graded secretory responses with a maximum of 119.3 μEq/hr at a pentagastrin dose of 32 μg/hr. The theoretical maximal response for pentagastrin, obtained by application of Michaelis-Menten equations to the observed responses, was 118.7 μEq/30 min. Metiamide (500 μg/hr) reduced the observed and calculated maximal response to pentagastrin to 64.1 and 66.4 μEq/30 min, resp. The secretory response to methacholine increased with increasing dosages; since doses higher than 128 μg/hr were followed by adverse side effects, maximal responses to this drug were not obtained. The median effective dose (ED_{50}) and calculated maximal response for methacholine were 24.1 and 175.8 μEq/30 min, resp. Metiamide did not alter the calculated maximal response, but 50 μg/hr metiamide inhibited the secretory response to lower doses (2-8 μg/hr) of methacholine and 500 μg/hr metiamide increased the ED_{50} to 90.8 μg/hr. The results are compatible with the hypothesis that pentagastrin is not a direct stimulant of the parietal cell but depends on an intermediary mechanism, i.e., the mobilization of histamine. No evidence was found that methacholine activates the H_2-receptor on the parietal cell. However, methacholine did block the action of histamine mobilized during the interdigestive state, thus interrupting the facilitating relation between small amounts of histamine and methacholine. The failure of metiamide to reduce the calculated maximal response to methacholine may be due to increased release of antral gastrin and subsequent mobilization of mucosal histamine.

8150 EFFECT OF PENTAGASTRIN ON SMALL BOWEL STRUCTURE AND FUNCTION IN THE RAT. *(E.)* Mayston, P. D.; Barrowman, J. A.; Dowling, R. H. (London Hosp. Medical Coll., London, England). *Digestion* 12(2):78-84, 1975.

The effects of chronic pentagastrin administration (2 mg/100 g/day for 15 days) on the structure and function of the duodenum and jejunum were studied in nine adult Wistar rats, while nine other rats receiving saline injections served as control. A one cm duodenal segment distal to the ampulla of Vater was excised for histological examination, and the distal 20 to 25 cm was cannulated for an *in vivo* recirculation-perfusion technique to evaluate glucose absorption. The mean wet weight of the proximal duodenum was 308 mg in treated rats and 231 mg in controls. No significant differences were noted in the weight of distal duodenum and proximal jejunum, in villus height and mucosal thickness, nor were there significant differences in glucose absorption. This suggests that chronic pentagastrin administration has a trophic effect limited to the proximal duodenum in the doses utilized in this study.

8151 EFFECTS OF AN ORALLY ADMINISTERED PROSTAGLANDIN ANALOGUE (16,16-DIMETHYL PROSTAGLANDIN E_2) ON HUMAN GASTRIC SECRETION. *(E.)* Wilson, D. E.; Winnan, G.; Quertermus, J.; Tao, P. (Abraham Lincoln Sch. Medicine, Univ. Illinois, P. O. Box 6998, Chicago, Ill. 60680). *Gastroenterology* 69(3):607-611, 1975.

The effects of p.o. administration of 16,16-dimethyl prostaglandin E_2 (DMPG) as the free acid on basal and histamine-stimulated gastric secretion in six healthy male volunteers (mean age 25.5 yr) are presented. Thirty-five studies were performed in which subjects were given one of four dosages of DMPG (0.75, 1.0, 1.25, 1.5 μg/kg) or placebo during histamine stimulation of gastric secretion and DMPG (1.5 μg/kg) or placebo during studies on basal secretion. Basal volume and acid output were 45 and 2.6 mEq/30 min, resp., and increased during submaximal stimulation with histamine to 93 and 13 mEq/30 min, resp. Thirty min after the instillation of DMPG (in 50 ml of water containing 1.0% polyethylene glycol), 76% of the amount administered had passed into the small intestine. A dose-response effect was noted in the inhibitory effect of DMPG; however, DMPG at 1.25 μg/kg had an inhibitory effect similar to that of the highest dose, whereas 1.0 μg/kg gave results similar to the lowest dose. DMPG (1.5 μg/kg) significantly inhibited gastric acid secretion for the entire two-hr study period, whereas the lowest dose inhibited acid secretion for 1.5 hr. The maximal inhibition always occurred during the first 30 min after administration (94% for DMPG at 1.5 μg/kg). Basal pepsin output was 34 ± 7 mg/30 min, increasing to 74 ± 13 mg/30 min during histamine stimulation. The highest dosages of DMPG caused significant declines in pepsin output. No subjects developed side effects attributable to DMPG. No changes in blood hematology, chemistry or urinalyses occurred. These studies indicate that when PGE_2 is administered p.o. as the free acid, it is a potent inhibitor of histamine-stimulated acid secretion in man at dosage levels that are free from side effects. It is suggested that prostaglandin analogues may be useful in treating peptic ulcer disease.

8152 COMPARATIVE GASTRIC ANTISECRETORY AND ANTIULCER EFFECTS OF PROSTAGLANDIN E_1 AND ITS METHYL ESTER IN ANIMALS. *(E.)* Dajani, E. Z.; Driskill, D. R.; Bianchi, R. G.; Collins, P. W. (Depts. Biological and Chemical Res., Searle Lab., P. O. Box 5110, Chicago, Ill. 60680). *Prostaglandins* 10(2): 205-215, 1975.

The effects of prostaglandin E_1 (PGE_1) and its methyl ester (PGE_1ME) on histamine-stimulated (60 μg/kg/hr,

i.v.) gastric acid secretion were compared in Heidenhain pouches in six female mongrel dogs. Their anti-ulcer effects were compared in male Charles River rats by the exertion ulcer model. After i.v. administration of 10.0 µg/kg/dog as a bolus, PGE_1 and PGE_1ME had peak antisecretory action at 30 min with durations of 60 and 90 min, resp. There was no effect on ionic composition of the secretions. By i.v. infusion at 1.0 µg/kg/min, PGE_1 demonstrated significant inhibition of secretion at 120 to 135 min after initiation, while PGE_1ME produced significant effects from 30 min after initiation to 150 min after termination of infusion, while significantly reducing H^+ concentration and increasing Na^+. Forced exercise in rats produced deep ulceration and bleeding in controls (10.3 ulcers/rat), while 1.0 mg/kg of PGE_1 s.c. reduced the incidence to 5.7 ulcers/rat and PGE_1ME reduced the ulcer incidence to 1.5/rat. ED_{50} was calculated for PGE_1 and PGE_1ME as 3.07 and 1.43 mg/kg, resp. PGE_1ME is a more potent and longer-acting inhibitor of histamine-induced gastric secretion and of forced exertion-induced ulcers than PGE_1. It is suggested that this difference is due to the increased lipophilicity of the methyl ester with resulting superior tissue distribution and reduced enzymatic ß-oxidation of the carboxyl side chain which would render it inactivated.

8153 INHIBITION OF GASTRIC ACID SECRETION IN MAN BY THE TRANSCRANIAL APPLICATION OF LOW INTENSITY PULSED CURRENT. *(E.)* Kotter, G. S.; Henschel, E. O.; Hogan, W. J.; Kalbfleisch, J. H. (Veteran's Admin. Hosp., 5000 West National Ave., Milwaukee-Wood, Wisc. 53193). *Gastroenterology* 69(2):359-363, 1975.

The effectiveness of transcranial electrotherapy (TCE) in reducing gastric acid secretion was studied in adult male volunteers aged 23 to 58 yr. In the first study, the basal secretion rates in five subjects were monitored before, during, and after the application of TCE at graduated current intensities. Secretion rates were monitored *via* a method of intragastric titration utilizing a pH-sensitive telemetry capsule which was ingested prior to testing by the subjects. In the second study, histamine-stimulated (0.4 mg/kg) maximum acid output was studied under basal conditions and during TCE application (1 ma current). In a third study, the uncomfortable sensations associated with high levels of TCE were simulated on the foreheads of six subjects, but no current was applied transcranially; the histamine-stimulated maximum acid output was also determined under these conditions. The first study indicated that TCE currents of 0.9 ma and greater caused a significant reduction (below control values) in basal gastric acid secretion. In the second study, TCE application resulted in highly significant reductions in histamine-stimulated maximum acid output; these reductions varied from 5.7 to 53.2%, with a mean of 30%. The third study showed no difference in maximum acid output under basal and placebo (simulated TCE discomfort) conditions, but an average reduction of 27.3% was obtained during actual TCE application. The data indicate that TCE can cause a highly significant reduction in both basal and histamine-stimulated gastric acid output. There was no permanent reduction in gastric secretion due to repeated TCE applications in a single subject.

8154 SIMULTANEOUS STUDY OF GASTRIC AND PANCREATIC SECRETION IN A PREPARATION PERFUSED EX VIVO. *(E.)* Kowalewski, K.; Kolodej, A. (Surgical-Medical Res. Inst., Univ. Alberta, Edmonton, Alberta, Canada). *Surg. Obstet. Gynecol.* 141(4):595-601, 1975.

Isolation and perfusion of gastro-pancreatic-duodenal preparations from adult mongrel dogs is reported and secretory function of the isolated pancreas and stomach were studied. Under i.v. pentobarbital anesthesia, laparotomy, splenectomy and bilateral thoracotomy through both crura of the diaphragm and central tendon were performed. The esophagus was isolated, ligated and transected, and the abdominal aorta was isolated from below the renal arteries to the lower portion of the thoracic aorta. Dissection, ligation and division of the pancreatic vessels were followed by cannulation of the main pancreatic duct and ligation of the accessory duct. The duodenum was divided just distal to the pancreatic attachment. Cannulation of the stomach through a duodenal incision and cannulation of the distal duodenum were performed. Ligation and transection of the abdominal aorta, hepatic artery and common bile duct, followed by transection of the superior aorta and the portal vein, allowed the preparation to be removed *en bloc*. Aortic and portal cannulas were connected with a perfusion circuit receiving blood from a second dog. The preparation was placed in a controlled temperature chamber. Perfusion by roller-pumps was begun at 60 to 80 ml/min for 20 min, then increased to 120 to 160 ml/min for the length of the experiment (6-8 hr). Infusion of secretin (120 U/hr) reduced gastric acid output from 3.5 mEq of HCl/30 min to 0.25 mEq of HCl/30 min, and H^+ concentration was reduced from 120 mEq/l to 60 mEq/l with pentagastrin infusion constant at 32 µg/hr. Pancreatic HCO_3 output increased from 0.0 mEq/30 min to 4.1 mEq/30 min and HCO_3 concentration increased from 40 mEq/l to 120 mEq/l upon secretin infusion. These results are similar to previous reports for isolated pancreas and isolated stomach preparations. *Ex vivo* preparation of the gastroduodenopancreatic block is a useful tool for evaluation of stomach and pancreatic function.

8155 INCREASING ACID RESPONSE TO A MEAL IN THE CHRONIC HEIDENHAIN POUCH. *(E.)* Saik, R. P. (Univ. California, San Diego, Sch. Medicine, San Diego, Calif.). *Surgery* 130(3):275-278, 1975.

Heidenhain pouches were constructed from the greater curvature of the stomach and drained with a Gregory cannula in four mongrel dogs to study long-term changes in acid output responses to a standard meat meal. No dogs demonstrated any change in basal acid output after six to eight months. At five hr after feeding, acid responses were 0.4, 0.8, 0.5 and 1.0 mEq/hr in the four dogs six to eight months after pouch construction, compared to 0.05, 0.05, 0.1 and 0.0 mEq/hr three wk after construction in each of the dogs. Gastrin outputs were not significantly changed in three dogs six to eight months after pouch construc-

tion (429 *vs* 411 pg-min/ml; 74 *vs* 165 pg-min/ml; 362 *vs* 117 pg-min/ml, resp.) and were elevated in one dog (700 *vs* 1786 pg-min/ml 8 months later). Two-hr pepsin outputs, measured in three dogs, were elevated six to eight months after pouch construction (18.72 *vs* 80.06, 34.91 *vs* 40.17, 2.38 *vs* 13.34 U of activity/ml, resp.). Light microscopy revealed more prominent mucosal villi in three of four dogs and increased fibrosis in two of four dogs at the time of sacrifice. Parietal cell counts were unchanged in three of four dogs and decreased in one (123.30 parietal cells/high-power field in pouch *vs* 202.00 cells in the fundus of the stomach). It appears that there is an increased acid response of the Heidenhain pouch to a meat meal over a long period of time, which is independent of parietal cell mass and gastrin secretion. It is suggested that pouch responses must be restudied when they are used for long-term gastrointestinal studies.

8156 EXPERIMENTAL ELECTROCOAGULATION OF DOG GASTRIC MUCOSA [abstract]. *(E.)* Papp, J. P.; Fox, J. M.; Wilks, H. S. (Blodgett Mem. Hosp., Grand Rapids, Mich.). *Gastroenterology* 68(4):1040, 1975.

8157 DEMONSTRATION OF A NEUTRAL COLLAGENASE FROM HUMAN GASTRIC MUCOSA [abstract]. *(E.)* Tucker, J. S.; Green, G.; Woolley, D.; Evanson, J. M.; Dymock, I. W. (Univ. Hosp. South Manchester, South Manchester, England). *Gut* 16(5):404, 1975.

8158 THE INTESTINAL PHASE OF GASTRIC SECRETION IN THE DOG [abstract]. *(E.)* Cairns, D. (Cent. Middlesex Hosp., England). *Gut* 16(5):406, 1975.

8159 INHIBITION OF GASTRIN AND GASTRIC ACID BY GROWTH HORMONE RELEASE INHIBITING HORMONE [abstract]. *(E.)* Bloom, S. R.; Russell, R. C. G.; Barros D'Sa, A. A. J.; Baron, J. H.; Besser, G. M.; Hall, R.; Coy, D. H.; Kastin, A. J.; Schally, A. V. (R. Postgrad. Med. Sch., London, England). *Gut* 16(5):396, 1975.

8160 EFFECTS OF SMALL BOWEL RESECTION ON THE DEVELOPING GASTRIC MUCOSA OF THE RAT [abstract]. *(E.)* Winborn, W. B.; Guerrero, D. L. (Univ. Texas Health Sci. Center, San Antonio, Texas). *Gastroenterology* 68(4):1066, 1975.

8161 INFLUENCE OF PARTIAL SMALL BOWEL RESECTION ON GASTRIC GLANDULAR CELL KINETICS IN THE RAT [abstract]. *(E.)* Seelig, L. L., Jr. (Univ. Texas Health Sci. Cent., San Antonio, Texas). *Gastroenterology* 68(4):1062, 1975.

8162 INHIBITION OF PENTAGASTRIN STIMULATED HEIDENHAIN POUCH SECRETION BY TRYPTOPHAN [abstract]. *(E.)* Valenzuela, J. E.; Bugat, R.; Grossman, M. I. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gastroenterology* 68(4):1056, 1975.

8163 STIMULATION OF GASTRIC ACID SECRETION BY THE CARBOXY-TERMINAL DIPEPTIDE AMIDE OF GASTRIN [abstract]. *(E.)* Bugat, R.; Grossman, M. I. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gastroenterology* 68(4):1055, 1975.

8164 PROTECTIVE EFFECT OF METIAMIDE ON ASPIRIN AND BILE INDUCED ACUTE EROSIVE GASTRITIS [abstract]. *(E.)* Mann, N. S.; Sachdev, A. (Univ. Louisville Sch. Med., Louisville, Ky.). *Gastroenterology* 68(4):945, 1975.

8165 CARBENOXOLONE EFFECTS ON GASTRIC MUCOSAL PERMEABILITY AND BLOOD FLOW [abstract]. *(E.)* Simons, M.; Moody, F. G. (Dep. Surg., Univ. Utah, Salt Lake City, Utah). *Gastroenterology* 68(4):957, 1975.

8166 SECRETION OF GASTRIC MUCUS IN RATS SUBJECTED TO COLD-RESTRAINT STRESS [abstract]. *(E.)* Pereira, J. N.; Hohnke, L. A.; Mears, G. A. (Cent. Res., Pfizer, Inc., Groton, Conn.). *Gastroenterology* 68(4):966, 1975.

8167 HISTAMINE INDUCED HYPOCALCEMIA IN THE RAT: NECESSITY OF A GASTRIC FACTOR [abstract]. *(E.)* Norbera, H. P.; Atlas, B.; Schulak, J. A.; Kaplan, E. L. (Dept. Surg., Univ. Chicago, Chicago, Ill.). *Gastroenterology* 68(4):922, 1975.

8168 EFFECTS OF CCK-OP (CHOLECYSTOKININ-OCTAPEPTIDE) AND PGE_2 (PROSTAGLANDIN E_2) ON DNA AND RNA OF GASTRIC AND DUODENAL MUCOSA [abstract]. *(E.)* Johnson, L. R. (Univ. Texas Med. Sch., Houston, Texas). *Gastroenterology* 68(4):920, 1975.

8169 IS cAMP REALLY PRESENT IN GASTRIC SECRETION [abstract]? *(E.)* Holian, O.; Gabrys, B. F.; Nyhus, L. M.; Bombeck, C. T. (Abraham Lincoln Sch. Med., Univ. Illinois, Chicago, Ill.). *Gastroenterology* 68(4):915, 1975.

8170 GASTRIC ACID SECRETION AND CIRCULATING GASTRIN LEVELS IN COLD-RESTRAINT STRESSED RATS [abstract]. *(E.)* Hohnke, L. A.; Pereira, J. N.; Wilder, D. E. (Pfizer Cent. Res., Groton, Conn.). *Gastroenterology* 68(4):914, 1975.

8171 GROWTH HORMONE: A POSSIBLE REGULATOR OF GASTRIN [abstract]. *(E.)* Enochs, M. R.; Johnson, L. R. (Univ. Texas Med. Sch., Houston, Texas). *Gastroenterology* 68(4):889, 1975.

8172 CALCIUM REQUIREMENT FOR PROTEIN SYNTHESIS AND SECRETION BY CULTURED BIOPSIES OF RABBIT GASTRIC MUCOSA [abstract]. *(E.)* Schafer, D. E.; Donaldson, R. M. (VA Hosp., New Haven, Conn.). *Gastroenterology* 68(4):885, 1975.

8173 GASTRIC MUCOSAL RESPONSES TO GRADED CONCENTRATIONS OF ETHANOL— A POSSIBLE ROLE FOR HISTAMINE [abstract]. *(E.)* Dinoso, V.; Chuang, J.; Murthy, S.; Ming, S. (Hahnemann Med. Coll., Philadelphia, Pa.). *Gastroenterology* 68(4):883, 1975.

8174 PROSTAGLANDIN E_2 PREVENTS GASTRIC MUCOSAL BARRIER DAMAGE [abstract]. *(E.)* Cohen, M. M. (Dep. Surg., Univ. British Columbia, Vancouver, B. C., Canada). *Gastroenterology* 68(4):876, 1975.

8175 ACID SECRETION AND POTENTIAL DIFFERENCE IN RESPONSE TO ANTRAL ETHANOL PERFUSION [abstract]. *(E.)* Bo-Linn, G. W.; Tague, L. L.; Shanbour, L. L. (Univ. Texas Med. Sch., Houston, Tex.). *Gastroenterology* 68(4):866, 1975.

8176 COMPARISON OF GASTRIN AND OCTAPEPTIDE-CCK STIMULATED H^+ SECRETION AND HORMONE BINDING IN NECTURUS GASTRIC MUCOSA [abstract]. *(E.)* Berkowitz, J. M.; Lefevre, M.; Praissman, M. (Nassau County Med. Cent., East Meadow, N. Y.). *Gastroenterology* 68(4):863, 1975.

8177 CELLULAR RESPONSE TO ULCEROGENIC AGENTS [abstract]. *(E.)* Waldron-Edward, D.; Boutros, M. I. R.; Himal, H. S. (R. Victoria Hosp., Montreal, Quebec, Canada). *Gastroenterology* 68(4): 911, 1975.

8178 AFTER VAGOTOMY ATROPINE SUPPRESSES GASTRIN RELEASE BY FOOD [abstract]. *(E.)* Debas, H. T.; Walsh, J. H.; Grossman, M. I. (VA Wadsworth Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):1058, 1975.

8179 ACID-FORMATION FUNCTION OF THE STOMACH AND INTRAGASTRAL PROTEOLYSIS. *(Rus.)* Gorshkov, V. A. (Dept. Propedeutic Internal Diseases, Leningrad Sanitary Hygiene Medical Inst., Leningrad, USSR). *Klin. Med. (Mosk.)* 53(2):112-116, 1975.

8180 GASTRIC SECRETION DURING OUABAIN MEDICATION. *(Ger.)* Bertz, D. P.; Wick, T. (Medizinische Poliklinik der Universitat Freiburg Br., Germany). *Med. Klin.* 70(6):228-230, 1975.

8181 GASTRIC SECRETION AND ULCER INHIBITING ACTIVITY OF A TRANQUILIZER-PARASYMPATHICOLYTIC DRUG COMBINATION. *(It.)* De Pascale, V.; Lavezzari, E.; Bamonte, F.; Craveri, F.; Frigo, G. M.; Crema, A. (Istituto di Farmacologia dell'Universita de Pisa, Pisa, Italy). *Boll. Chim. Farm.* 114(1):35-52, 1975.

8182 RELATIONSHIP BETWEEN VAGAL INNERVATION AND THE SELF-REGULATION OF ACID SECRETION IN THE ANTRUM (ANIMAL EXPERIMENT). *(Ger.)* Schramm, H.; Pitzler, K.; Sellentin, W. (Chirurgischen Klinik und Poliklinik der Friedrich-Schiller-Universitat, Germany). *Z. Exp. Chir.* 8(1):52-57, 1975.

8183 HISTOLOGICAL, HISTOCHEMICAL AND FLUORESCENCE-MICROSCOPIC INVESTIGATIONS OF THE GASTRIC MUCOSA AND OF THE ENDOCRINE PANCREAS AFTER TRUNCULAR VAGOTOMY. *(Ger.)* Petermann, J.; Reding, R.; Beckert, R.; Dorn, A.; Ziegler, M. (Chirurgische Universitatsklinik, DDR-22 Greifswald, Fr.-Loeffler-Str. 23b, Germany). *Z. Exp. Chir.* 7(6):369-373, 1974.

8184 GASTRIC SECRETION. *(E.)* Konturek, S. J. (Medical Acad., Krakow, Poland). *Gastrointestinal Physiology*, vol. 4, edited by E. D. Jacobson and L. L. Shanbour. Baltimore, Md., Univ. Park Press, 1974, pp. 227-264.

8185 PURIFICATION OF GASTRONE, ENDOGENOUS INHIBITOR OF GASTRIC ACID SECRETION AND ITS BIOASSAY ON RATS WITH CHRONIC GASTRIC FISTULA [abstract]. *(E.)* Lopes, J. D.; Glass, J. G. B. (New York Med. Coll., New York, N. Y.). *Clin. Res.* 23(3):439A, 1975.

8186 EVIDENCE FOR SEPARATE HISTAMINE AND PROSTAGLANDIN SENSITIVE ADENYLATE CYCLASES (AC) IN GUINEA PIG GASTRIC MUCOSA (GM) [abstract]. *(E.)* Wollin, A.; Code, C. F.; Dousa, T. P. (Mayo Clin., Rochester, Minn.). *Clin. Res.* 23(3):260A, 1975.

8187 RELATION OF HALF-LIFE ($T_{\frac{1}{2}}$) TO SECRETORY POTENCY OF HUMAN GASTRIN-17-1 (HG-17-1) IN MAN [abstract]. *(E.)* Beniface, J.; Schebalin, M.; Zfass, A. M.; Makhlouf, G. (Med. Coll. Virginia, Richmond, Va.). *Clin. Res.* 23(3):246A, 1975.

8188 EFFECTS OF ANTRAL PERFUSION WITH ETHANOL ON FUNDIC ACID SCRETION AND POTENTIAL DIFFERENCE [abstract]. *(E.)* Bo-Linn, G. W.; Shanbour, L. L. (Univ. Texas Med. Sch., Houston, Tex.) . *Clin. Res.* 23(3):246A, 1975.

8189 BIOSYNTHESIS AND SECRETION OF INTRINSIC FACTOR BY RABBIT AND HUMAN GASTRIC MUCOSAL BIOPSIES IN ORGAN CULTURE [abstract]. *(E.)* Donaldson, R. M.; Behar, J.; Serfilippi, D. (West Haven VA Hosp., Conn.). *Clin. Res.* 23(3):439A, 1975.

8190 THE SUDDEN POTENTIAL DROP IN FROG GASTRIC MUCOSA [abstract]. *(E.)* Kidder, III, G. W. (Univ. Maryland Sch. Dentistry, Baltimore, Md.). *Fed. Proc.* 34(3):396, 1975.

8191 COMPLEMENT ACTIVATION AND GASTRIC MUCOSAL PERMEABILITY [abstract]. *(E.)* Medina, F.; Peter, E. T.; Pollara, B. (Dept. Surg., Univ. Mexico, Albuquerque, N.M.). *Fed. Proc.* 34(3):3532, 1975.

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8193 PARAMETERS FOR INTRADUODENAL pH GRAPHS IN DOGS. *(Rus.)* Kienia, A. I. (Dept. Human Animal Physiology, State Univ., Gomel, USSR). *Fiziol. Zh. SSSR* 61(7):1086-1089, 1975.

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8195 FORMATION OF MUCOUS GEL FROM THE HIGH MOLECULAR WEIGHT MUCOPROTEIN OF GASTRIC MUCUS. *(E.)* Allen, A.; Pain, R. H.; Snary, D. (Dep. Biochem., Univ. Newcastle upon Tyne, England). *Faraday Discuss. Chem. Soc.* (57): 210-220, 1974.

8196 THE STUDY ON THE EFFECTS OF THERAPEUTIC DRUGS FOR PEPTIC ULCER ON TISSUE RESPIRATION AND GLYCOLYSIS OF GASTRIC MUCOSA. *(E.)* Matsubayashi, K.; Yoshizumi, M.; Koga, N.; Nishimura, R.; Tachibana, M.; Ueda, A.; Sano, H.; Yamate, S.; Tanaka, K. (Kurume Univ. Sch. Medicine, Kurume, Japan). *Kurume Med. J.* 21(4):123-128, 1974.

8197 GASTRIC MOTILITY AND GASTRIC ACIDITY IN EXPERIMENTAL GASTRIC ULCER. *(Cz.)* Popperova, E.; Niks, M.; Hulin, I. (Univ. Komenskeho v Bratislave, veduci doc, MUDr. M. Niks, CSc.). *Folia Fac. Med. Univ. Comenianae Bratisl.* 12(1):55-105, 1974.

8198 CHANGES IN BLOOD GASTRIN IN MAN AFTER INTRAVENOUS INJECTION OF CORTISOL. *(It.)* Giordano, G.; Marugo, M. (Istituto Scientifico Medicina Interna, Universita Genova, Italy). *Boll. Soc. Ital. Biol. Sper.* 50(22):1905-1910, 1974.

8199 EARLY VARIATIONS IN GASTRIC SECRETION AND BLOOD GASTRIN LEVELS AFTER ANTRAL TRANSPORTATION INTO COLON IN THE RAT. *(Fr.)* Bonnefond, A.; Nasca, S.; Dubrasquet, M. (INSERM U-10, 170, Boulevard Ney, F 75877 Paris Cedex 18, France). *Biol. Gastroenterol. (Paris)* 8(1):45-52, 1975.

See also, 8054, 8365.

SECRETION AND METABOLISM

Pancreas

8200 THE RELATIVE POTENCY OF THE CRICK-HARPER-RAPER UNIT AND THE GIH CLINICAL UNIT OF SECRETIN. *(E.)* Braganza, J. M.; Howat, H. T.; Kay, G. (Manchester Royal Infirmary, England). *Gut* 16(7): 549-552, 1975.

A reinvestigation of the relationship between the Crick-Harper-Raper (CHR) and the GIH clinical units (CU) of secretin was undertaken in four anesthetized cats to determine whether the CHR standard used by the Boots Company to assay secretin had lost some specific activity. The splanchnic nerves were divided extraperitoneally. The pancreatic duct was cannulated, and the common bile duct was obliterated by the ligature retaining the cannula. The pylorus was occluded by a broad tape ligature. Since a preliminary experiment indicated that one CHR U of Boots secretin was about four times less potent than one CU of GIH secretin, rapid i.v. injections of one and two CHR U/kg of Boots secretin and 0.25 and 0.50 CU/kg of GIH secretin were used in each cat. The order of administration of the secretins was determined by a 2 x 2 Latin square arrangement, with the restrictions of equal number of observations/dose, equal number of doses/substance, equal logarithmic spacing of the doses, and that the higher doses of the two secretins were not given consecutively. Observations were recorded at 15-min intervals and 30 to 45 min were allowed to elapse between injections. The volume of pancreatic juice was recorded to the nearest 0.01 ml. Bicarbonate concentration was measured by back titration after treatment with 0.1 N HCl. A preliminary analysis using three doses of GIH secretin (0.125, 0.25, 0.5 CU/kg) and three doses of Boots secretin (0.5, 1.0, 2.0 CHR U/kg) showed that a linear equation

significantly described the relation between log dose and volume of pancreatic juice or bicarbonate output in each instance. The log-dose response lines for Boots and GIH secretin (2 x 2 assay) were parallel for both volume of juice and bicarbonate output. A comparison of the relative potency of the GIH CU and the CHR U of Boots secretin, as specified on the labels, yielded a ratio of 3.8:1 for rate of flow and 4:1 for bicarbonate. From the data presented here, doubling the dose of Boots secretin from 2 to 4 CHR U/kg does not increase the volume or bicarbonate output of pancreatic juice.

8201 THE EFFECT OF ACUTE ETHANOL ADMINISTRATION ON THE EXOCRINE PANCREATIC SECRETION OF THE PIG. *(E.)* Wheatley, I. C.; Barbezat, G. O.; Hickman, R.; Terblanche, J. (Univ. Cape Town Med. Sch., South Africa). *Br. J. Surg.* 62(9):707-712, 1975.

The acute effects of ethanol (0.5 ml/kg by continous i.v. infusion for 2 hr or 5% in 0.15 M NaCl infused intragastrically at a rate of 20 ml/kg/hr for 1 hr) on secretin- (1 U/kg/hr) and cholecystokinin- (1 U/kg/hr) stimulated exocrine pancreatic secretion were studied in anesthetized female Large White X Landrace pigs with chronic pancreatic and gastric fistulas. The pancreatic fistulas were established with a new H-type pancreatic cannula. With the gastric fistula open or closed, alcohol, Nacl (0.15 M) or mannitol (15% in 0.15 M NaCl) administration was superimposed on the background hormonal stimulation. Samples from the fistulas were collected at 15 min intervals, and blood was taken 30-240 min after the commencement of alcohol administration. With the gastric cannula open, i.v. alcohol significantly increased the mean volume of gastric juice secreted without changing the pancreatic volume of bicarbonate secretion. The protein content in the pancreatic juice decreased significantly, the maximal depression occurring at the end of the fourth hr when the blood alcohol level peaked (0.09 mg/100 ml blood). With the gastric cannula closed, i.v. alcohol caused a marked rise in the mean volume of pancreatic secretion and in the bicarbonate output; the protein output did not vary significantly from basal levels. Infusion of saline produced no significant changes in any parameters if the gastric cannula was open or closed. With intragastric alcohol, there was a pronounced and persistent rise in the mean volume of pancreatic secretion, the bicarbonate output, and the protein output. Peak secretion was reached simultaneously with the peak blood alcohol level 2 hr after the beginning of alcohol administration. Intragastric mannitol produced a rapid rise in pancreatic secretion volume followed by a rapid decline after the third hr to basal levels; parallel effects on bicarbonate and protein outputs were observed. The secretin-like effect of alcohol on pancreatic secretion volume and bicarbonate output did not appear to be a direct effect of alcohol on the pancreas; it is likely that the pancreatic effects were produced by alcohol-released gastrin or cholecystokinin.

8202 MECHANISM OF RELEASE OF ENDOGENOUS CHOLECYSTOKININ BY JEJUNAL AMINO ACID PERFUSION IN MAN. *(E.)* Ertan, A.; Brooks, F. P.; Arvan, D.; Williams, C. N. (Philadelphia Veteran's Admin. Hosp., Pa.). *Am. J. Dig. Dis.* 20(9):813-823, 1975.

The mechanism by which perfusion of the jejunum with a mixture of amino acids mediates an increase in exocrine pancreatic and biliary secretions was studied in five normal human subjects. The tip of one lumen tube (I) was placed about 40 cm distal to the ligament of Treitz and the tip of a second tube (II) was passed to the fourth portion of the duodenum. A mixture of amino acids (MAA) or saline solution was infused through tube I and, on other occasions, this perfusion was combined with a single application of oxethazaine hydrochloride (0.5 mg/kg of a 0.4% solution) to the proximal jejunum at the beginning of the first or second hr of MAA perfusion. At other times, the patients received i.v. cholecystokinin (CCK) with or without topical oxethazaine, and/or atropine sulfate (1 mg/l) in the MAA perfusate. Duodenal samples were continuously aspirated through tube II. The pancreatic (trypsin) and biliary (bile salt) responses to jejunal MAA perfusion were significantly reduced in four patients for about one hr after oxethazaine application (during the second hr of perfusion); in the following hr, the pancreatic secretory and biliary responses were partially restored. Oxethazaine also inhibited the bicarbonate, amylase, protein, and bilirubin responses to jejunal MAA. The response to MAA perfusion was also significantly reduced, for 60 to 75 min, when oxethazaine was given during the first hr of perfusion. The responses to i.v. CCK and jejunal saline perfusion were not affected by jejunal oxethazaine. Oxethazaine produced no local or systemic side effects and no histological changes in the jejunum. All responses to jejunal MAA perfusion were significantly reduced by the addition of atropine to the perfusate; when the MAA perfusion was continued without atropine, the responses were partially restored. The jejunal application of atropine did not alter the pancreatic and biliary responses to i.v. CCK or jejunal saline perfusion. These results support the hypothesis that the endogenous release of CCK from the jejunal mucosa depends on the stimulation of intact cholinergic receptors, while exogenous CCK appears to act directly on the pancreatic cell.

8203 ROLE OF CALCIUM IN EXOCRINE PANCREATIC SECRETION. I. CALCIUM MOVEMENTS IN THE RABBIT PANCREAS. *(E.)* Schreurs, V. V. A. M.; Swarts, H. G. P.; De Pont, J. J. H. H. M.; Bonting, S. L. (Dept. Biochemistry, Univ. Nijmegen, The Netherlands). *Biochim. Biophys. Acta* 404(2):257-267, 1975.

The pattern of calcium movements in the intact, isolated rabbit pancreas and in pancreatic fragments was studied. The pancreases were isolated from male and female New Zealand white rabbits and both the intact and fragmented tissues were incubated in balanced salt solution. After one hr, the tissues were placed in medium containing $^{45}Ca^{2+}$ and, occasionally, (^{3}H)mannitol plus 2 mM

mannitol. In some experiments, carbachol (10^{-5} M) or acetylcholine (10^{-5} M) was added to the medium, and in other cases partial or nearly complete removal of $^{45}Ca^{2+}$ was effected prior to stimulation. In the intact pancreas experiments, pancreatic fluid was collected at five-min intervals, and in the fragmented pancreas experiments, efflux medium samples were collected at five- or 15-min intervals. The addition of $^{45}Ca^{2+}$ to the incubation medium resulted in the immediate appearance of isotope in the fluid secreted from the intact tissues; a constant specific activity was reached within 30 min, the absolute activity in the secreted fluid being 30 to 40% of that in the incubation medium. The addition of carbachol after two-hr preincubation with $^{45}Ca^{2+}$ resulted in enzyme secretion and calcium release; a maximal increase in $^{45}Ca^{2+}$ secretion was noted 10 min after maximal enzyme secretion and calcium release. The increase in $^{45}Ca^{2+}$ secretion was reduced by the partial removal of $^{45}Ca^{2+}$ prior to stimulation; the reduction was nearly proportional to the amount of isotope removed. (^{3}H)mannitol added to the incubation medium also appeared in the secretion fluid and reacted to carbachol in the same manner as $^{45}Ca^{2+}$. Upon repeated acetylcholine stimulation, a $^{45}Ca^{2+}$ peak appeared even in the virtual absence of enzyme secretion; the peak coincided with a small total calcium peak. Efflux studied in the pancreatic fragments showed a carbachol-stimulated $^{45}Ca^{2+}$ efflux in addition to amylase release. The data indicate that there are three patterns of calcium movement in the rabbit pancreas which can be influenced by cholinergic agents: an extracellular route for calcium and other small molecules and ions; a calcium release across the apical membrane along with the enzymes, originating from a pool which does not freely exchange with $^{45}Ca^{2+}$ in the bath; and a calcium flux across the serosal membrane which involves calcium exchanging freely with $^{45}Ca^{2+}$ from the bath. The latter flux is thought to result from an increase in cytoplasmic calcium, which may be involved in the stimulus-secretion coupling of pancreatic enzyme secretion.

8204 ENTEROPANCREATIC CIRCULATION OF DIGESTIVE ENZYME AS A CONSERVATION MECHANISM. *(E.)* Götze, H.; Rothman, S. S. (Dept. Physiology, Univ. California, San Francisco, Calif. 94143). *Nature* 257(5527):607-609, 1975.

An effort was made to more fully determine whether the enteropancreatic circulation of digestive enzyme is a trace process or a process in which substantial amounts of enzyme are circulated and thereby conserved. The pancreatic duct of male white New Zealand rabbits was cannulated *in situ* after a median laparotomy under DIAL-urethane anesthesia and subsequent to a 20-hr fast. The continuity of the gastrointestinal lumen was maintained; protein content was estimated by ultraviolet absorption at 280 nm. After a 30-min unstimulated collection period, maximal secretion of both protein and fluid was continuously elicited by half-hr injections of acetyl-β-methylcholine (0.5 mg/kg, s.c.) and porcine secretin (1 Ivy dog U/kg, i.v.). Samples were collected at 30 min intervals. When pancreatic juice was completely diverted from the intestine, a roughly exponential decay in protein secretion was observed. In the continued presence of the cholinergic stimulus, secretion decreased by about 90% over a 4.5 hr period, although it was still enhanced relative to the secretion of protein from unstimulated glands at the same time. In further experiments, pancreatic digestive enzyme secretion was collected, stimulated as before, and measured in its protein content and immediately reintroduced into the duodenum, thereby maintaining the continuity of the natural process. The fall-off under these conditions was indeed less than during diversion. A relatively steady protein output was maintained under these conditions for about three hr, although not at maximal rates. The increase in protein secretion after protein instillation into the intestinal lumen was 61.3% of the amount instilled for the complete experiment and reached a maximum of 83% for the period of peak response. An additional experiment was performed in which pancreatic juice was again completely diverted, but at 120 min one Ivy dog U of purified cholecystokinin-pancreozymin/kg was injected in addition to the other stimulants. No additional augmentation of protein secretion was observed. While circulation of digestive enzyme is the most direct interpretation of these data, the injected or instilled enzyme could still have produced the effect in other ways such as by the release of as yet undescribed secretagogues or by regulating enzyme secretion directly at the acinar cell level.

8205 THE COURSE AND NATURE OF ACINAR CELL DEATH FOLLOWING PANCREATIC LIGATION IN THE GUINEA PIG. *(E.)* Zeligs, J. D.; Janoff, A.; Dumont, A. E. (New York Univ. Sch. Medicine, New York, N. Y.). *Am. J. Pathol.* 80(2):203-226, 1975.

Ultrastructural studies carried out on female Camm-Hartley albino guinea pig pancreas at various intervals after pancreatic ligation are described. The present studies were undertaken with specific regard to the nature of acinar cell death (ACD). The mechanisms involved in this process are of interest in the evaluation of pancreatic ligation as a model for human disease, including cystic fibrosis and pancreatitis. The animals were fasted for 6 to 15 hr prior to surgery and anesthetized with 4 mg Nembutal/100 g. With sterile technique, a silk ligature was passed about the entire pancreas (insuring that no secondary ductal patency persisted) and tied tightly midway along the pancreatic tail. This procedure provided a "ligated" arm of pancreatic tissue (distal to ligature) as well as a portion of the gland with uninterrupted ductal drainage which served as control tissue. After the desired period of ligation, guinea pigs were refasted and reanesthetized and the abdomen was reopened for excision of control and experimental portions of pancreas. Ultrastructural studies after periods of ligation (0, 0.5, 1, 3, 4, and 12 hr; 1, 2, 3, 4, 5, 7, and 10 days; 2, 3, 4, and 12 wk; and 1 and 2 yr) suggested a biphasic pattern of ACD. Early phase ACD involved only a small portion of acinar cells and occurred within a few hours of ligation. It was preceded by swell-

ing and vesiculation of the rough endoplasmic reticulum. Morphometric measurements disclosed cellular swelling at this time, and NaCl equilibrium studies demonstrated a change in cellular osmoregulation. Late phase ACD, characterized by cellular wasting and autophagic vacuole formation, became prominent several days after ligation. Marked increases in lysosomal enzyme activities were found in tissue homogenates at this time, and acid phosphatase electron histochemistry localized the majority of this increased activity to lysosomes and autophagic vacuoles within the acinar cells. The etiology and nature of both phases of ACD are discussed. It is suggested that ACD is not a response of cells subjected to stress, but that it represents part of an orderly remodeling process designed to remove nonfunctioning tissue and to insure against a potentially lethal form of pancreatitis.

8206 PANCREATIC SECRETION IN THE RAT: INFLUENCES OF OPERATIVE PROCEDURE, ANESTHESIA, HYPOTHERMIA AND DRAINAGE OF GASTRIC OR PANCREATIC JUICE. *(Fr.)* De Waele, B.; Desmul, A.; Wissocq, P.; Kiekens, R. (Brugmann Hosp., Vrije Univ., Brussels, Belgium). *Biol. Gastroenterol. (Paris)* 7(4): 253-263, 1974.

Investigations were performed on three groups of rats to establish optimum conditions for studying pancreatic secretion in waking rats with stable body temperatures. All rats were anesthetized with chloral hydrate (46 mg/100 g, i.v.) for about 1.5 hr. Pancreatic fistulas were established by a modification of Colwell's technique in which none of the principal pancreatic ducts are ligated. Rats studied included: 1) rats with only a pancreatic fistula; 2) pylorus-ligated rats with gastric and pancreatic fistulas; and 3) pylorus-ligated rats with gastric and pancreatic fistulas prepared in such a way that pancreatic juice could be injected into the duodenum through a catheter. In group 1, basal pancreatic secretion was very low immediately after surgery. Secretion of pancreatic juice and the HCO_3^- and protein outputs increased gradually, reaching a plateau 48 hr after surgery; this was maintained with little variation for the next 44 hr. Similar results were obtained in group 2. In group 2, basal gastric acid output was very low after surgery, but increased gradually and stabilized at 24.0 ± 5.9 μEq of HCl/100 g/hr. None of the rats in any of the three groups developed gastric ulcers. Reanesthesia of rats in group 1 with urethane (125 mg/100 g, i.p.) two or three days after surgery caused a slight decrease in the volume of pancreatic juice and a moderate but significant decrease in protein output without any appreciable change in the HCO_3^- output. In group 2, urethane anesthesia had no effect on pancreatic secretion but totally inhibited gastric acid secretion. When rats were subjected to hypothermia at 32 and 35 C, no change occurred in the volume of pancreatic secretion, the HCO_3^- output increased and the protein output decreased. At 32 C, the protein output decreased to at least 50% of the basal value. Reinjection of pancreatic juice into the duodenum produced a moderate but significant decrease in the protein output (by a mean of 18%); decreases in volume and the HCO_3^- output were not significant. The protein output increased again after reinjection of pancreatic juice, and there was a correlation between the trypsinogen output and the total protein output. It is concluded that, in rats, pancreatic secretion should be studied 48 hr after establishment of pancreatic fistulas; conscious animals with body temperatures stabilized at 38 C should be employed.

8207 ALTERATIONS IN PANCREATIC ACINAR CELL ORGANELLES DURING CIRCULATORY SHOCK. *(E.)* Herlihy, B. L.; Lefer, A. M. (Univ. Virginia Sch. Medicine, Charlottesville, Va.). *Circ. Shock* 2(3):143-153, 1975.

The alterations in pancreatic subcellular particles and their distribution during splanchnic artery occlusion (SAO) shock and the modification of these changes by chronic pancreatic duct ligation were studied in adult cats of both sexes. The main pancreatic duct and the accessory pancreatic duct were ligated and, five to six wk later, the animals were subjected to sham SAO, SAO shock, or chronic duct ligation shock. After a two-hr occlusive period, the artery clamps were removed and the pancreas was excised when the mean arterial blood pressure declined to 50 to 60 mm of Hg. The pancreas was subjected to cell fractionation by differential centrifugation and assayed for β-glucuronidase, cathepsin D, neotetrazolium succinate reductase, amylase, and protein. The tissue was also examined under the electron microscope. There was no difference in size between the control and shock pancreases, but the pancreatic atrophy associated with duct ligation dramatically reduced the size of the ligated pancreases. Amylase and neotetrazolium succinate reductase activities and protein content were significantly higher in the control tissues than in the SAO shock tissues, and were significantly higher in the SAO shock tissues than in the duct-ligation-shock tissues. There were no significant changes in lysosomal enzyme, cathepsin D, or β-glucuronidase. The relative specific activity of amylase was higher in the S_4 fractions and lower in the P_3 fractions of the shock groups than in the same fractions of the control groups. β-Glucuronidase relative specific activity was higher in the P_2 fraction of the shocked pancreases than in the same fraction of the control tissues, and was also higher in the P_4 fraction of the duct ligation pancreases than in the same fraction of the duct-ligation-shock pancreases. Cathepsin D relative specific activity was higher in the P_3 fraction of the shock groups than in the P_3 fraction of the controls. The shock pancreases demonstrated a decreased relative specific activity of neotetrazolium succinate reductase in the P_3 fraction and an increased activity in the P_2 fraction. As demonstrated by electron microscopy, the duct-ligated tissues contained relatively dark lysosomes with many apparently phagocytosed bodies inside them. The data indicate that pancreatic subcellular organelles may play an important role in the development of the shock state and that modification of pancreatic acinar cells by chronic pancreatic duct liga-

tion can help to prevent the autolytic response of these cells.

8208 EFFECTS OF CHOLERA TOXIN ON CYCLIC ADENOSINE 3',5'-MONOPHOSPHATE CONCENTRATION AND SECRETORY PROCESSES IN THE EXOCRINE PANCREAS. *(E.)* Smith, P. A.; Case, R. M. (Univ. Medical Sch., Newcastle upon Tyne, NE1 7RU, England). *Biochim. Biophys. Acta* 399(2):277-290, 1975.

The effect of purified cholera toxin (1.0 µg/ml) on the secretory processes of the exocrine pancreas was studied in the isolated, saline-perfused cat pancreas and in baby rat uncinate pancreas incubated in medium similar to the cat perfusion fluid. Samples of pancreatic juice from the cat experiments were analyzed for amylase activity as an index of total enzyme secretion. In addition, cyclic AMP concentrations were determined in small pieces of rat and cat pancreas. The cholera toxin evoked a biphasic secretory response from the perfused cat pancreas. A small initial phase, which was noted within minutes of toxin application, was an artifact due to the presence of NaN_3 in the toxin preparation. The second, sustained phase of secretion was due to the action of the toxin itself and began within 30-60 min, increasing in magnitude for many hours and persisting following the removal of toxin from the perfusion fluid. The pattern and magnitude of the second secretory response did not change with toxin concentrations between 0.5 and 2.0 µg/ml. The second toxin-induced secretory response was accompanied by a parallel rise in the tissue cyclic AMP concentration; this phenomenon was demonstrated in both the cat and rat tissues. Theophylline (5×10^{-4} M) caused a modest increase in toxin-stimulated secretion and in the tissue cyclic AMP concentration (83.7% and 66.3%, resp.). Cholera toxin did not stimulate enzyme secretion by the incubated rat pancreas. These results offer no evidence that cyclic AMP plays a mediating role in the regulation of cholecystokinin-pancreozymin- or acetylcholine-stimulated pancreatic enzyme secretion.

8209 PROTEIN DIGESTION AND ABSORPTION IN RATS WITH PANCREATIC DUCT OCCLUSION [abstract]. *(E.)* Curtis, K. J.; Kim, Y. S. (VA Hosp., San Francisco, Calif.). *Gastroenterology* 68(4):1071, 1975.

8210 THE PHYSICAL CHEMISTRY OF PANCREATIC CALCIFICATION AND STONE FORMATION: A TEST OF THE MODEL IN CANINE PANCREATIC JUICE [abstract]. *(E.)* Moore, E. W.; Zimmerman, M. J. (Virginia Commonwealth Univ., Richmond, Va.). *Gastroenterology* 68(4):959, 1975.

8211 THE PHYSICAL CHEMISTRY OF PANCREATIC CALCIFICATION AND STONE FORMATION: II. THE EQUILIBRIUM FORMATION CONSTANTS OF THE SOLUBLE CALCIUM COMPLEXES $CaHCO_3^+$ AND $CaCO_3$ [abstract]. *(E.)* Moore, E. W.; Verine, H. J. (Virginia Commonwealth Univ., Richmond, Va.). *Gastroenterology* 68(4):960, 1975.

8212 THE PHYSICAL CHEMISTRY OF PANCREATIC CALCIFICATION AND STONE FORMATION: III. A THERMODYNAMIC MODEL FOR THE PHYSIOCHEMICAL STATE OF CALCIUM IN PANCREATIC JUICE [abstract]. *(E.)* Moore, E. W.; Verine, H. J. (Virginia Commonwealth Univ., Richmond, Va.). *Gastroenterology* 68(4):959, 1975.

8213 DISSOCIATION OF INTRAPANCREATIC AMYLASE AND CHYMOTRYPSINOGEN BEHAVIOUR FOLLOWING PZ-LIKE STIMULATION BY OLEIC ACID [abstract]. *(E.)* Dagorn, J. C.; Paradis, D.; Morisset, J. (GI Res. Univ., Sherbrooke Univ., Sherbrooke, Quebec, Canada). *Gastroenterology* 68(4):879, 1975.

8214 INHIBITION OF SECRETIN RELEASE BY ANESTHESIA [abstract]. *(E.)* Boden, G.; Sivitz, M. C.; Brander, W.; Essa, N.; Landor, J. H. (Temple Univ. Health Sci. Cent., Philadelphia, Pa.). *Gastroenterology* 68(4):865, 1975.

8215 ADENYL CYCLASE AND cAMP IN ACUTE EXPERIMENTAL PANCREATITIS: BIOCHEMICAL AND HISTOCHEMICAL STUDY [abstract]. *(E.)* Gabrys, B. F.; Holian, O.; Mackenzie, M.; Nyhus, L. M.; Bombeck, C. T. (Abraham Lincoln Sch. Med., Chicago, Ill.). *Gastroenterology* 68(4):896, 1975.

8216 CHANGES IN PANCREATIC SECRETIONS (PS), AMINO ACID TRANSPORT (AT) AND ENTEROKINASE ACTIVITY (EA) AFTER PROXIMAL INTESTINAL RESECTION (PR) IN THE RAT [abstract]. *(E.)* Van Caillie, M.; Morin, C. L.; Ling, V.; Deschenes, N. (Hosp. Saint Justine, Montreal, Quebec, Canada). *Gastroenterology* 68(4):1064, 1975.

See also, 8137, 8154, 8183, 8251, 8279, 8393.

8217 FUNCTIONAL HETEROGENEITY OF RAT LIVER PARENCHYMA AND OF ISOLATED HEPATOCYTES. *(E.)* Sasse, D.; Katz, N.; Jungermann, K. (Anatomisches Institut, Albert-Ludwigs-Universität, 78 Freiburg, Germany). *FEBS Lett.* 57(1):83-88, 1975.

The functional heterogeneity of rat liver parenchyma was studied in relation to the fasting interval. Female Wistar rats were fasted for 1, 8, 24 or 36 hr prior to liver exsanguination *in situ* by the nonrecirculating preperfusion technique used for isolating hepatocytes. In cryostat sections, glucose-6-phosphatase (G-6-P) was demonstrated by precipitating phosphate liberated from glucose-6-phosphate using lead. Glycogen synthetase (GS) was detected by staining glycogen using the PAS reaction. Glycogen phosphorylase (GP) was located by staining glycogen with Lugol's solution. The size of areas were estimated by planimetry. In fed rats, G-6-P activity was high in periportal areas and absent around central veins. GS and GP were restricted to periportal zones. Glycogen was demonstrated in all hepatocytes. The GS level after 24-hr starvation was very low in periportal areas, whereas GP increased with some infiltration into intermediate and perivenous zones. The G-6-P level was not altered after eight hr of starvation, but after 24 hr, high activity was found in all three zones with a value of 8.70 U/g of liver in 24-hr-starved rats and 4.45 U/g of liver in fed rats. The amount of G-6-P reached its highest level in zone 3 after 36 hr of starvation. The area occupied by G-6-P increased from 60% in fed rats to 85% in 24-hr starved rats. This was due more to an increase in the number of enzyme-rich cells than to an absolute increase in enzyme levels. Thus, hepatocytes from the same physiologic state can have a different complement of active enzymes which probably also have different metabolic functions.

8218 CRITIQUE OF THE "CRITICAL MASS" HYPOTHESIS OF THE REGENERATION OF LIVER CELLS. *(E.)* Togendorff, J.; Trebin, R.; Ruhenstroth-Bauer, G. (Max-Planck-Institut Biochemie, Martinsried bei Munchen, Germany). *Am. J. Pathol.* 80(3):519-524, 1975.

Johnson's hypothesis that the regulation of liver cell regeneration is triggered by the critical mass of the cells was examined. Analysis of the equations derived by Johnson showed that Equation 3 does not mathematically describe the volume reduction of individual cells occurring 60 hr after partial hepatectomy. In fact, the equation describes the growth of the remaining fraction of the liver as though it were a consequence of the increase in volume of each individual cell. According to this equation, cells would grow by 100% following a 50% reduction of the liver and by 400% when only one-fifth of the organ is conserved. The applicability of the Johnson theory was further checked by determining the volume distribution of hepatocytes and the mitotic index at 12 to 138 hr after partial hepatectomy in female BDE-inbred rats. The dispersion of values was too significant to indicate the probability distribution necessary to confirm the existence of a critical volume. Thus, the critical volume theory is not suitable for use in describing the mitotic regulation of liver regeneration.

8219 PROLIFERATION OF MONONUCLEAR PHAGOCYTES (KUPFFER CELLS) AND ENDOTHELIAL CELLS IN REGENERATING RAT LIVER: A LIGHT AND ELECTRON MICROSCOPIC CYTOCHEMICAL STUDY. *(E.)* Widmann, J. J.; Fahimi, H. D. (Harvard Medical Sch., Boston, Mass.). *Am. J. Pathol.* 80(3):349-366, 1975.

The proliferation of littoral cells in regenerating rat liver after partial hepatectomy was investigated using endogenous peroxidase and uptake of large (0.8 μ) latex particles as markers of Kupffer cells. Female Charles River rats were subjected to two-thirds partial hepatectomy and sacrificed at intervals up to 11 days. Prior to sacrifice, the animals were injected i.v. with latex and their livers were fixed by perfusion through the portal vein with glutaraldehyde. Tissues from two different areas of each of the remaining lobes were processed for cytochemical localization of the peroxidase. The sinusoidal cells exhibited a marked regenerative response after partial hepatectomy. Peroxidase activity persisted in the endoplasmic reticulum of Kupffer cells during mitosis. Furthermore, the latex particles were exclusively localized in peroxidase-positive cells, thus confirming their identity as dividing Kupffer cells. Quantitative counts revealed that the peak mitotic activity of Kupffer cells occurred at 49 hr, whereas that of endothelial cells was at 96 hr after partial hepatectomy. No morphologic evidence of transformation of endothelial cells or monocytes to Kupffer cells was found. These results suggest that after partial hepatectomy, Kupffer cells in regenerating liver are formed predominantly by local cell division.

8220 STIMULATION OF HEPATOCYTES AND LYMPHOCYTES IN VITRO BY LIVER REGENERATION. *(E.)* Sakai, A.; Kountz, S. L. (Downstate Med. Cent., State Univ. New York, Brooklyn). *Nature (Lond.)* 257(5521): 53-54, 1975.

The mechanism by which hepatectomy and subsequent liver regeneration modifies the immune reaction and stimulates DNA synthesis was studied *in vitro* using sera from male Lewis rats subjected to 70% partial hepatectomy or sham surgery. The animals were exsanguinated 8 hr after surgery, and primary liver cell cultures derived from Lewis rat fetuses (18-20 days gestation) were incubated with the sera at a final concentration of 10% and with ^{3}H-thymidine (2.5 μCi/ml). Lymphocyte suspensions from Lewis rats were similarly treated. A marked increase in DNA synthesis was seen in the liver cells cultured with serum from the partially hepatectomized rats (PH serum); serum from sham-operated

syngeneic (Lewis) and allogeneic (BN) rats was also mitogenic in this system. The PH serum had no mitogenic effect on rat kidney cell cultures. Serum from partially hepatectomized, sham-operated, and normal rats also stimulated lymphocyte DNA synthesis; the effect of PH serum was significantly greater than that of the other 2. Furthermore, the PH serum stimulated mitosis of both liver cells and lymphocytes significantly more than sera from the normal and sham-operated animals. The results are consistent with the hypothesis that hepatectomy increases a mitogenic serum humoral factor which stimulates both hepatocytes and lymphocytes in culture; it does not appear to decrease inhibitor. It remains to be seen whether there is one factor or more triggering hepatocyte and lymphocyte replication.

8221 THE FORMATION OF ENLARGED AND GIANT MITOCHONDRIA IN THE AGING PROCESS OF HUMAN HEPATIC CELLS. *(E.)* Sato, T.; Tauchi, H. (Aichi Cancer Center Hosp., Nagoya, Japan). *Acta Pathol. Jpn.* 25(4):403-412, 1975.

Liver tissue from 61 Japanese men and women (aged 21-81 yr) was studied ultramicrometrically to determine the mechanism of formation of enlarged and giant mitochondria during the aging process in human hepatic cells. The subjects showed no abnormalities on routine liver function tests and liver samples were microscopically free of pathological conditions. The number of mitochondria per hepatic cell area significantly decreased with age after 60 yr; their size significantly increased after 65 yr of age. Although the total mitochondria area per hepatic cell area increased with age, it decreased slightly between 60 and 64 yr of age. In subjects aged less than 49 yr, the mitochondrial cristae were sparsely distributed (0.75-1.70 μ^2 in area) in the majority of mitochondria. In the early half of the seventh decade of life, the cristae were compactly distributed in the mitochondria, while in subjects aged 70 yr or more, the mitochondrial cristae were comparatively thinly distributed. The enlarged mitochondria in all age groups showed no evidence of degeneration or swelling, and the membrane systems demonstrated distinct cytochrome c oxidase activity. Intramitochondrial inclusion substances increased in those older than 65 yr and were digested after incubation with RNase. It appears that the abnormal growth of mitochondria is due to incomplete division following the synthesis of new mitochondrial material during the process of hypertrophy. The hypertrophic processes appear to begin with an increase in the cristae.

8222 THE CELLULAR DISTRIBUTION OF LIPOSOMES IN THE LIVER OF NEWBORN RATS. *(E.)* De Barsy, T.; Devos, P.; Van Hoof, F. (Lab. Clin. Physiol., Univ. Louvain, I.C.P., Bruxelles, Belgium). *Biochem. Soc. Trans.* 3(1):159-160, 1975.

Attempts were made to inhibit the postnatal degradation of rat liver glycogen by inhibiting the hepatic lysosomal α-glucosidase with specific antibodies entrapped in liposomes. As much as 30-50% of the fluorescein-labeled antibodies were incorporated into liposomes composed of lecithin, cholesterol, and stearylamine in a molar ratio of 7:2:1. A sample (0.1 ml) of this liposome suspension was administered to newborn rats through the umbilical cord vein, and the fate of the liposomes and labeled proteins in the liver were studied. Half of the injected proteins were present in the liver 7 and 12 hr after the injection. The inhibition of acid α-glucosidase never exceeded 40%, and the glucogen content did not differ significantly from control values. Electron microscopic studies showed that 7 hr after injection the Kupffer cells were swollen by large vacuoles containing electron-lucent spaces, lipid debris and, more rarely, multilamellar structures. Modifications in the parenchymal cells were more discrete, the general appearance of these cells being normal except for the presence of multilamellar concentric structures in the lysosomal apparatus. These structures appeared to be almost intact liposomes.

8223 MOUSE MODEL FOR PROTOPORPHYRIA. I. THE LIVER AND HEPATIC PROTOPORPHYRIN CRYSTALS. *(E.)* Gschnait, F.; Konrad, K.; Honigsmann, H.; Denk, H.; Wolff, K. (Div. Experimental Dermatology, Univ. Vienna, Vienna, Austria). *J. Invest. Dermatol.* 65(3):290-299, 1975.

Livers from outbred albino mice fed a diet containing 2.5% (weight) griseofulvin for 1 to 175 days were examined for the presence of protoporphyrin (PP), the morphologic changes induced by the drug, and the nature of intrahepatic PP crystals. RBC-PP values were also determined. Liver PP and RBC-PP values were elevated on the fifth day of griseofulvin treatment and continuously increased thereafter. The livers enlarged significantly within three to four wk and, after three months, weighed up to five times more than the livers of untreated controls. Brown pigment granules were found in the cytoplasm of liver cells and in bile canaliculi as early as 48 hr after griseofulvin treatment, and after five days the granules were present in activated Kupffer cells, portal macrophages, and bile ducts. Changes reminiscent of cholestatic liver damage were apparent after two wk of griseofulvin feeding, and irregular cirrhosis was noted after 145 days. The granules showed red fluorescence, birefringence, and, at the ultrastructural level, consisted of aggregates of needle-like crystals. Crystals isolated from such livers had the solubility and absorption characteristics of PP; *in vitro* recrystallization of the PP extracted from protoporphyric mouse livers yielded crystals identical to those observed *in vivo*. Commercial PP exhibited similar morphologic features. The liver pathology and PP crystals observed in these animals are identical to the liver pathology and crystals found in human erythropoietic protoporphyria. In this mouse model, PP crystals are intimately associated with hepatocellular injury and their accumulation within hepatocytes appears to lead to hepatocellular destruction. A similar pathogenesis is postulated for the hepatic damage that occurs in some cases of erythropoietic protoporphyria.

8224 COPPER-BINDING PROTEINS IN THE NEONATAL AND ADULT RAT LIVER SOLUBLE FRACTION. *(E.)* Evans, G. W.; Wolenetz, M. L.; Grace, C. I. (Human Nutrition Lab., Grand Forks, N. D. 58201). *Nutr. Rep. Int.* 12(4):261-269, 1975.

Copper-binding proteins were isolated from the soluble fractions of neonatal Wistar rat liver and of liver from three adult rats injected with 200 µg Cu^{2+} daily for three days. In both preparations, copper was eluted from Sephadex G-75 in four distinct fractions, and that portion which eluted ahead of the total volume was purified further on Sephadex G-50. The elution volume of this copper-containing fraction was identical to that of the cadmium-binding protein obtained from the liver of cadmium-loaded rats. Electrophoresis indicated that the migration distance of each of the protein preparations was identical to that of serum albumin. The amino acid composition of the copper-binding protein from neonatal rat liver was very similar to that of metallothionein, while the amino acid composition of the protein from copper-injected rats differed from that of metallothionein. The protein isolated from neonatal liver and from cadmium-loaded rats contained 20 to 24% cysteine, but the protein from copper-loaded rats contained only 5% cysteine. The neonatal protein contained more zinc than copper, while the protein from the copper-injected rats contained more copper than zinc. The cadmium-binding protein contained no detectable copper. The results indicate that two distinct proteins are involved in hepatic copper binding under physiologic and pathologic conditions.

8225 ADENINE NUCLEOTIDE CONTENT OF HUMAN LIVER. NORMAL VALUES AND FRUCTOSE-INDUCED DEPLETION. *(E.)* Hultman, E.; Nilsson, L. H.; Sahlin, K. (Dept. Clinical Chemistry, Beckomberga sjukhus, S-161 04 Bromma 4, Stockholm, Sweden). *Scand. J. Gastroenterol.* 35(3):245-251, 1975.

A special sampling technique for the determination of metabolites in human liver samples *in vivo* is described and normal values of ATP, ADP, AMP, pyruvate and lactate in human liver are presented. Percutaneous biopsies taken from 12 healthy subjects (8 men and 4 women, aged 21-40 yr) were frozen by plunging the needle in liquid freon (-150 C). The mean sampling time was 2.0 sec; in three samples, the freezing was delayed by 5.0 sec. The normal values of ATP, ADP, AMP, pyruvate and lactate determined from the liver samples of healthy subjects were: 8.23 ± 1.96 mM/kg, 3.80 ± 0.61 mM/kg, 0.88 ± 0.60 mM/kg, 1.20 ± 0.58 mM/kg and 2.7 ± 1 to 4.6 mM/kg, resp. Infusion of D-fructose (5.9 mM/kg/hr for 70 min) resulted in a 22.5% decrease of the adenine nucleotide pool (mainly ATP depletion); it increased content of fructose 1-phosphate, lactate, and pyruvate. The extent of adenine nucleotide depletion varied greatly between subjects and appeared to be related to the increase of plasma urate. This finding supports the hypothesis that increases in plasma urate during fructose infusion originate from enhanced adenine nucleotide breakdown. Infusion of glucose at the same rate did not affect the hepatic content of adenine nucleotides. No significant changes in the adenine nucleotides were detected when the sampling period was extended by 5 sec. Thus, it is concluded that the values obtained with this method reflect the *in vivo* adenine nucleotide contents.

8226 COMPARISON OF RAT HEPATIC MICROSOMAL MIXED-FUNCTION OXIDASE ACTIVITES IN MICROSOMAL PREPARATIONS, ISOLATED HEPATOCYTES AND LIVER SLICES. *(E.)* Gerayesh-Nejad, S.; Jones, R. S.; Parke, D. V. (Dep. Biochem., Univ. Surrey, Guildford, England). *Biochem. Soc. Trans.* 3(3):403-405, 1975.

To determine the importance of cellular integrity in hepatic drug metabolism, various model enzyme systems (benzo[*a*]pyrene hydroxylase, biphenyl 4-hydroxylase, thiabendazole hydroxylase, and ethylmorphine *N*-demethylase) were studied in liver microsomal preparations, isolated hepatocytes, and liver slices from male Wistar rats. With the exception of biphenyl hydroxylase, maximum enzyme activities were observed in the microsomal preparations, followed by the liver slices and the hepatocytes. Biphenyl hydroxylase activity was greatest in hepatocytes, followed by the microsomal preparations and slices. In the microsomal preparations and hepatocytes, maximum enzyme activity was observed within the first 5 min. In contrast, with the exception of ethylmorphine *N*-demethylase, maximum enzyme activity in the slices was generally observed after intervals greater than 5 min. Biphenyl 4-hydroxylase activity in the hepatocytes was lost more rapidly than the activity in the other preparations; this may have been due to a loss of cofactors into the incubation media in addition to enzyme degradation. The data appear to refute the hypothesis that cellular integrity is necessary for optimum hepatic metabolic rates.

8227 ON HISTOCHEMICAL ENZYME CHANGES IN ASSOCIATION WITH CANALICULAR ACTIVITY OF ALKALINE PHOSPHATASE IN HUMAN LIVER. *(E.)* Hagerstrand, I. (Malmo General Hosp., 21401, Malmo S, Sweden). *Acta Pathol. Microbiol. Scand.* [*A*] 83(5): 527-533, 1975.

Fifty-six liver biopsy specimens with insignificant or no histologic changes but with extensive canalicular alkaline phosphatase activity were studied histochemically for other enzyme changes. In comparison with normal specimens, 22 of the 53 specimens showed more extensive and increased canalicular activity of gamma-glutamyl transferase. In 12 of 49 specimens, leucyl aminopeptidase activity was increased in canaliculi but markedly decreased in sinusoids. Staining for adenosine triphosphatase regularly disclosed a normal pattern of sinusoidal and canalicular activity. In 20 of 31 specimens, the activity of beta-glucuronidase, a lysosomal enzyme, was clearly increased in the cytoplasm and in hepatocytes of the pericanalicular region. A similar pattern of activity was observed in 26 of 39 specimens stained for the lysosomal enzyme acid phosphatase. Enzymes present in the cytosol (LDH), in the mitochondria (succinic dehydrogenase, mono-

amine oxidase), and in the endoplasmic reticulum (glucose-6-phosphatase) showed normal staining patterns. It is concluded that the previously observed canalicular alkaline phosphatase activity represents a true increase in enzyme activity, which is apparently connected with the induction of the hydroxylating system of smooth endoplasmic reticulum.

8228 A COMPARISON OF CANINE NORMAL HEPATIC ALKALINE PHOSPHATASE AND VARIANT ALKALINE PHOSPHATASES OF SERUM AND LIVER. *(E.)* Hoffmann, W. E.; Dorner, J. L. (Coll. Veterinary Medicine, Univ. Illinois, Urbana, Ill. 61801). *Clin. Chim. Acta* 62(1):137-142, 1975.

A study was conducted to confirm the source of the corticosteroid-induced isoenzyme of serum (SAP-CS) as being the corticosteroid-induced liver enzyme, alkaline phosphatase (LAP-CS), as well as to confirm the fact that the variant liver alkaline phosphatase produced in lymphosarcoma (LAP-L) was identical to the enzyme LAP-CS. Serum and liver samples were obtained from seven dogs: one with a hyperactive adrenal cortex, one with advanced lymphosarcoma, and the remaining were five normal dogs. Twenty-five liver samples were subjected to butanol extraction and serum was diluted 1:1 with saline. Isoenzymes from both liver and serum were precipitated by ethanol fractionation and were subjected to cellulose acetate electrophoresis. The Michaelis constant for nitrophenol phosphate of each isoenzyme was determined using a double-reciprocal plot. Heat stability at 56 C, as well as inhibitory effects of L-glycine, L-phenylalanine and L-leucine from concentrations of 0.001 to 0.1 M were determined. The normal hepatic isoenzyme (LAP-N) precipitated in between 33 to 50% ethanol concentration, whereas LAP-CS and LAP-L precipitated in between 54 to 67% ethanol concentration. The pH optimum for LAP-N was 10.2 and that of SAP-CS, LAP-L and LAP-CS was 9.7. The Michaelis constants for LAP-N, LAP-CS, LAP-L and SAP-CS were 0.87, 1.45, 1.49, and 1.48, resp. The isoenzymes LAP-CS, LAP-L and SAP-CS had the same heat stability and were more stable than LAP-N. The enzymes LAP-L, LAP-CS and SAP-CS were not inhibited by glycine unless concentrations exceeded 0.05 M. At concentrations of 0.01, 0.05 and 0.1 M phenylalanine inhibited LAP-N considerably less than the other three enzymes. Inhibition by L-leucine was identical for all four enzymes. It was concluded that SAP-CS, LAP-CS and LAP-L were identical enzymes and that they were not steroid-induced, but were distinctly different from the normal hepatic enzyme.

8229 HEPATIC ALBUMIN AND UREA SYNTHESIS: THE MATHEMATICAL MODELLING OF THE DYNAMICS OF (^{14}C)CARBONATE-DERIVED GUANIDINE-LABELLED ARGININE IN THE ISOLATED PERFUSED RAT LIVER. *(E.)* Tavill, A. S.; Nadkarni, D.; Metcalfe, J.; Black, E.; Hoffenberg, R.; Carson, E. R. (M.R.C. Clinical Res. Center, Harrow, Middlesex HA1 3UJ, England). *Biochem. J.* 150(3):495-509, 1975.

A mathematical model was constructed to define the dynamics of incorporation of radioactivity into urea carbon and the guanidine carbon of arginine in the plasma albumin after the rapid intraportal-venous administration of $Na_2{}^{14}CO_3$ in the isolated perfused rat liver. The model was formulated in terms of compartmental analysis and additional experiments were designed to provide further information on subsystem dynamics and to discriminate between alternative model structures. Evidence for the rapid time-constants of labeling of intracellular arginine was provided by a precursor-product analysis of precursor (^{14}C)carbonate and product (^{14}C)urea in the perfusate. Compartmental analysis of the dynamics of newly synthesized urea was based on the fate of exogenous (^{13}C)urea, endogenous (^{14}C)urea, and the accumulation of (^{12}C)urea in perfusate water, confirming the early completion of urea carbon labeling, the absence of continuing synthesis of labeled urea, and the presence of a small intrahepatic urea-delay pool. Analysis of the perfusate dynamics of endogenously synthesized and exogenously administered (6-^{14}C)arginine indicated that although the capacity for the extrahepatic formation of (^{14}C)urea existed, little or no arginine formed within the intrahepatic urea cycle was transported out of the liver. However, the presence of a rapidly turning-over intrahepatic arginine pool was confirmed. On the basis of of these subsystem analyses, it was possible to offer feasible estimations of the parameters of the mathematical model. However, it was not possible to simulate the form and magnitude of the dynamics of newly synthesized labeled urea and albumin, which were observed simultaneously after the administration of (^{14}C)carbonate, on the basis of a preliminary model which postulated that both products were derived from a single hepatic pool of (6-^{14}C)arginine. These observed dynamics could be satisfied by a two-compartment arginine model, which also provided an explanation of discrepancies observed beween albumin synthesis measured radioisotopically and immunologically. This was based on a relative overestimation of (^{14}C)urea specific radioactivity resulting from the rapid dynamics of (^{14}C)-carbonate and the (^{14}C)urea subsystem relative to the labeled albumin subsystem. The effects of arginine compartmentalization could be minimized in the model by minor slowing of the rate of (^{14}C)carbonate turnover or by constant infusion of (^{14}C)carbonate, both of which permitted valid determinations of the albumin systhesis rates.

8230 SYNTHESIS OF PLASMA HAEMOPEXIN, ALBUMIN AND FIBRINOGEN BY THE REGENERATING RAT LIVER. *(E.)* Murray-Lyon, I. M.; Liem, H. H.; Eberhard-Muller, U. (Scripps Clinic and Res. Foundation, La Jolla, Calif. 92037). *Br. J. Exp. Pathol.* 56(3):247-255, 1975.

The incorporation of [^{3}H]-L-leucine into plasma hemopexin, albumin, and fibrinogen was used to study the synthesis of these compounds in the rat. The production of hemopexin, albumin, and fibrinogen by the isolated perfused male Sprague-Dawley rat liver was also determined at various intervals following laparotomy and partial hepatectomy. In

the first study, [^{3}H]-L-leucine (100 μCi/100 g) was injected into the tail vein 4 to 48 hr after surgery and its incorporation into hemopexin, albumin, and fibrinogen was determined 60 min later. The mean plasma hemopexin levels were significantly higher 24 and 48 hr after laparotomy than at similar intervals after hepatectomy, while the levels 24 and 48 hr after hepatectomy were significantly higher than at 4 hr and significantly higher than in the unoperated controls. At all intervals after hepatectomy and laparotomy, the incorporation of isotope into plasma hemopexin was greater than in the controls, the greatest values being observed at 24 hr; the increase was always greater after hepatectomy than after laparotomy. Similar results were found regarding fibrinogen concentration and synthesis, whereas the plasma albumin concentration at 24 and 48 hr was significantly reduced in both the hepatectomy and laparotomy groups, and there was no statistically significant increase in isotope incorporation into albumin during the 48 hr after partial hepatectomy. A short but significant increase in isotope incorporation into albumin was observed in the laparotomy group four hr after surgery. The mean plasma protein concentration was significantly reduced at each time interval following hepatectomy, but was unchanged following laparotomy. Isotope incorporation into total plasma protein was significantly increased in the hepatectomized group compared with the laparotomized group, and was significantly increased in the laparotomized group at 4 and 24 hr compared with the control group. Hemopexin and albumin production were increased after hepatectomy in the liver perfusion studies, whereas only hemopexin production was increased after laparotomy. The ratio between the production of albumin and the production of hemopexin was significantly higher in the controls than in the laparotomy group. No significant change in hematocrit was observed in any group. It appears that, unlike serum albumin synthesis, there is a high priority for hemopexin and fibrinogen synthesis after partial hepatectomy and laparotomy.

8231 INHIBITION BY COLCHICINE OF FIBRINOGEN TRANSLOCATION IN HEPATOCYTES. *(E.)*
Feldmann, G.; Maurice, M.; Sapin, C.; Benhamou, J. P. (Hopital Beaujon, 92110 Clichy, France). *J. Cell Biol.* 67(1):237-243, 1975.

The presence of fibrinogen in hepatocytes of adult male rats injected i.p. with colchicine (2.5 mg/kg) was studied by means of antirat fibrinogen antibodies labeled with peroxidase. Under the light microscope, numerous fibrinogen-containing hepatocytes were detectable in the vicinity of the portal triad eight hr after colchicine administration. The reaction was less intense at 16 hr and by 32 hr only a few hepatocytes contained fibrinogen. By electron microscopy, fibrinogen was found to be abundant in the lumina of the rough endoplasmic reticulum at eight hr after colchicine injection. At 16 hr, fibrinogen was abundant in the lumina of the smooth endoplasmic reticulum and was present in small amounts in the lumina of the rough endoplasmic reticulum. At 24 hr, fibrinogen was not present in the lumina of the rough endoplasmic reticulum, was detectable in small amounts in the lumina of the smooth endoplasmic reticulum, and was abundant in the lumina of the Golgi apparatus. Microtubules were almost completely lacking in the cytoplasm of hepatocytes of colchicine-treated animals. The effect of colchicine on the cytoplasmic translocation of fibrinogen could be due to a direct action of the drug on the membranes of the endoplasmic reticulum or could be the indirect result of the disruptive action of the drug on the microtubules.

8232 BILE SALT METABOLISM IN THE HUMAN PREMATURE INFANT: PRELIMINARY OBSERVATIONS OF POOL SIZE AND SYNTHESIS RATE FOLLOWING PRENATAL ADMINISTRATION OF DEXAMETHASONE AND PHENOBARBITAL. *(E.)* Watkins, J. B.; Szczepanik, P.; Gould, J. B.; Klein, P.; Lester, R. (Children's Hosp. Medical Center, Boston, Mass.). *Gastroenterology* 69(3): 706-713, 1975.

Bile salt synthesis and bile salt pool size were determined in nine healthy premature infants (32-36 weeks gestation), four of whose mothers had received dexamethasone or phenobarbital prior to delivery. Tetra-deuterated cholic acid (5 mg) and chenodeoxycholic acid (3 mg) were administered by nasogastric tube to 3 to 11-day-old infants. Duodenal fluid (1-5 ml) was obtained through an infant feeding tube 30 to 90 min after the start of feeding. Bile salt synthesis and bile salt pool size were determined by isotope dilution. The total bile salt pool was 19.5 mg in the children of the untreated mothers and 79.3 mg in the infants of the drug-treated mothers. The bile salt synthesis rate in the untreated group was 8.2 mg/day, compared to 26.7 mg/day in the drug-treated group. The cholic acid pool in the treated group was 321 mg/sq m of body surface and the cholic acid synthesis rate was 98 mg/sq m/day. These values were similar to those in full-term infants and nearly three times greater than those in the untreated group. The intraduodenal bile salt concentrations obtained during meals was also low in the untreated group (1.2 mM) as compared with the treated group (5.3 mM). The data indicate that the functional maturity of the liver, and possibly that of the gastrointestinal tract, is reduced in premature infants. They also suggest that this maturity may be dramatically influenced by medications administered to the mother prior to delivery.

8233 BARBITURATES AND BILIARY FUNCTION. *(E.)* Capron, J. P.; Erlinger, S. (Hopital Beaujon, Clichy, France). *Digestion* 12(1):43-56, 1975.

The literature concerning the principal effects of phenobarbital on biliary function is reviewed. When administered for 3 to 15 days, phenobarbital increases bile flow in the rat and in the rhesus monkey; after a single injection of 80 mg/kg, the increase in bile flow is detectable after six hr and is maximal after 14 hr. Administration of phenobarbital for a longer time (seven days in the rat,

15 in the rhesus monkey) is followed by an increase in both bile salt-independent bile flow and bile salt excretion. In man, phenobarbital (180 mg/day for 4-7 days) may increase the bile salt-independent flow. The effect of phenobarbital on bile flow is due mainly to an increase in the canalicular bile salt-independent bile flow and may involve an increase in canalicular Na^+-K^+ ATPase activity. The phenobarbital-induced increase in bile flow appears to be unrelated to the effects of barbiturates on microsomal enzyme induction. Phenobarbital also increases the uptake, storage, and excretion of various dyes (e.g., BSP and indocyanine green) used to study hepatobiliary function. In addition to enhancing hepatic clearance in bilirubin in the rat and the rabbit, phenobarbital increases liver bilirubin-uridine diphosphate-glucuronyl transferase activity in animals and man. The biliary excretion of a number of exogenous compounds (e.g., chlorothiazide, ouabain, benzpyrene) and of some endogenous compounds (e.g., thyroxin, vitamin D) is increased by phenobarbital. The influence of phenobarbital on biliary lipids differs markedly from one species to another: after phenobarbital treatment, the relative cholesterol concentration decreases in the rhesus monkey and the rat, increases in the hamster, and remains largely unaffected in man. These effects of phenobarbital have been utilized in the treatment of chronic unconjugated hyperbilirubinemia, Gilbert's syndrome, the Dubin-Johnson syndrome, and some cholestatic syndromes. Although phenobarbital may decrease cholesterol saturation of the bile, the drug has not been successful in the treatment of cholesterol gallstones.

8234 PRODUCTION OF FERRITIN BY RAT HEPATOMA CELLS IN VITRO. *(E.)* Lee, J. C. K.; Lee, S. S. C.; Schlesinger, K. J.; Richter, G. W. (Univ. Rochester Sch. Medicine and Dentistry, Rochester, N. Y. 14642). *Am. J. Pathol.* 80(2):235-248, 1975.

The distribution of protein subunit-positive and ferritin-positive sites and the sequence of events in the formation of ferritin molecules was studied. Immunodiffusion, immunoelectrophoresis, disc electrophoresis and immunofluorescent staining were used to evaluate Reuber H-35 and H-139 hepatoma cells and Morris 5123 (M-5123) hepatoma cells. The hepatomas had originally been passaged in rats; they were explanted, propagated, and grown in ordinary Mc Coy's 5a medium or in medium enriched with iron (0.002% Fe). The cells were then treated with rabbit antibodies specific for either the protein subunits of ferritin or ferritin, 0.9% aqueous NaCl, serum from unimmunized goats, phosphate-buffered saline, immunoglobulin from unimmunized rabbits, or sera from unimmunized rabbits. Explants from each type of hepatoma gave rise to at least two cell populations: hepatoma cells and fibroblast-like cells. The hepatoma cells and fibroblasts from each tumor type grown in ordinary or iron-enriched medium gave specific immunofluorescence for subunits and ferritin. Subunit-specific immunofluorescence was evident in 80 to 90% of the hepatoma cells of the Morris 5123 cell clone; this immunofluorescence did not increase after iron-treatment. However, the exposure of a clonal strain of Morris 5123 hepatoma cells to iron-enriched culture medium resulted in a progressive increase in the quantity of ferritin-specific immunofluorescence; this immunofluorescence was diffuse at first and later appeared in clumps. Specific immunofluorescent staining was also seen in the nuclei of hepatoma cells treated with serum IgG from a rabbit treated with complete Freund's adjuvant and 0.9% aqueous NaCl. The positive intranuclear immunofluorescence was abolished after absorption of subunit-directed IgG with preparations of nuclei from the livers or kidneys of ACI rats. Specific antibodies to IgG from rabbits immunized with protein subunits of ACI rat liver ferritin did not produce intranuclear immunofluorescence. The data indicate the presence, in the cytoplasm of the cells studied, of unassembled or only partly assembled subunits or fragments of subunits as well as ferritin. They also indicate the rapid assembly of the protein subunits into apoferritin and ferritin after the administration of iron, with no significant change in the concentration of subunits in the cytoplasm.

8235 THE INTERACTION OF VARIOUS CONTROL MECHANISMS IN DETERMINING THE RATE OF HEPATIC CHOLESTEROGENESIS IN THE RAT. *(E.)* Weis, H. J.; Dietschy, J. M. (Medizinische Klinik, Johannes Gutenberg-Universität, Mainz, Germany). *Biochim. Biophys. Acta* 398(2):315-324, 1975.

The rate of hepatic cholesterogenesis was studied in female Sprague-Dawley rats following the superimposition of different light cycles and stress on a background of altered synthetic activity. The altered activity was caused by feeding cholesterol (0.1 g/100 g of diet), cholestyramine resin (2 g/100 g of diet), or β-sitosterol (7 g/100 g of diet), or by fasting. The animals were simultaneously subjected to diurnal light-cycling for varying periods of time and, in some cases, were placed in restraining cages for 48 hr prior to killing. In control animals exposed to light cycling for two wk, the rate of hepatic cholesterogenesis was 3.7-fold higher in the mid-dark than in the mid-light phase of the cycle. The magnitude of this difference varied with the duration of light cycling and with the size of the animal. Similarly, enhanced rates of cholesterol synthesis were seen in the mid-dark phase relative to the mid-light phase of the light cycle in rats in which the baseline level of hepatic cholesterogenesis was increased by feeding cholestyramine (1.6-fold) or β-sitosterol (2.9-fold) or was depressed by fasting (19-fold) or by cholesterol feeding (2.1-fold). Restraining the animals for 48 hr also increased the rate of hepatic cholesterol synthesis; in control animals, this stress enhanced the level of cholesterogenesis seen at both the mid-light and mid-dark phases of the light cycle. In addition, the effects of stress and diurnal cycling could be identified in groups of animals in which the base-line cholesterogenic activity was changed by fasting or by feeding cholestyramine, β-sitosterol, or cholesterol. The data illustrate the complexity of the mechanism controlling hepatic cholesterol synthesis and suggest that the final

rate of cholesterogenesis may be the result of several different effectors modifying by different mechanisms the activity of β-hydroxy-β-methylglutaryl-CoA reductase.

8236 STEROID OXIDOREDUCTASE ACTIVITY OF ALCOHOL DEHYDROGENASES FROM HORSE, RAT, AND HUMAN LIVER. *(E.)* Cronholm, T.; Larsen, C.; Sjovall, J.; Theorell, H.; Akeson, A. (Kemiska institutionen, Karolinska instituet, S-104 01 Stockholm, Sweden). *Acta Chem. Scand.* [B] 29(5): 571-576, 1975.

The steroid activity of alcohol dehydrogenases from horse liver was investigated by determining the rate of formation of reduced nicotinamide adenine dinucleotide (NADH) in incubations of the alcohol dehydrogenase isoenzymes (EE, ES, and SS) with 18 3-hydroxysteroids. The NAD concentration of the reaction mixtures was 0.5 mM. Alcohol dehydrogenases from rat and human liver were tested for rates of NAD formation with 3β-hydroxy-5β-cholanoate and 17β-hydroxy-5β-andostan-3-one. Isoenzymes SS and ES (but not EE) from horse liver, as well as the rat and human liver enzymes, catalyzed the NAD-dependent oxidation of 3β-hydroxy groups in 5α- and 5β-steroids of the C_{19}, C_{21}, and C_{24} series. The enzymes from horse and rat liver were more active on 5β- than on 5α-steroids. This difference was most marked with the enzyme from rat liver, especially with 3β-hydroxyandrostan-17-ones and 3β-hydroxypregnan-20-ones as substrates. The K_m of isoenzyme ES from horse liver was lower for 3β-hydroxy-5α-cholanoic acid (0.4 μM) than for 3β-hydroxy-5β-cholanoic acid (0.9 μM). Human liver alcohol dehydrogenase had low affinity for 3β-hydroxy-5α (and 5β)-cholanoic acids, but oxidation could be clearly demonstrated by gas chromatographic analysis of the products.

8237 TURNOVER OF PALMITOYLCARNITINE IN RAT LIVER. *(E.)* Akesson, B. (Dept. Physiological Chemistry, Univ. Lund, Lund, Sweden). *Biochim. Biophys. Acta* 393(3):485-489, 1975.

The metabolism of palmitoylcarnitine *in vivo* was studied in fed male rats injected intraportally with 0.25 ml of a solution containing 12 mg albumin and 60 μCi (9,10-$^3H_2$)palmitic acid. At various intervals thereafter, the liver lipids were extracted and palmitoylcarnitine was isolated from the lipids by thin-layer chromatography. The radioactivity in palmitoylcarnitine was maximal within the first five sec after injection of [^{3}H]palmitic acid, concomitant with the rapid elimination of isotope from the free fatty acids. The isotope was then rapidly eliminated from the palmitoylcarnitine. During the first six sec, six to ten times more palmitic acid was incorported into glycerolipids than was directed into palmitoylcarnitine, the ratio of palmitoylcarnitine synthesis to phosphatidic acid synthesis up to six sec after injection ranging between 0.10 and 0.44. Using these figures, the rate of palmitoylcarnitine synthesis was calculated to be 0.49 μM palmitic acid/min/10 g of liver. The fractional turnover of this compound was estimated to be 13.2 min^{-1}. The data are consistent with the view that acylcarnitines are transiently formed when acyl residues are transported into the mitochondria.

8238 PENTOBARBITAL PHARMACOKINETICS IN THE NORMAL AND IN THE HEPATECTOMIZED RAT. *(E.)* Ossenberg, F. W.; Peignoux, M.; Bourdiau, D.; Benhamou, J. P. (Hosp. Beaujon, 92110 Clichy, France). *J. Pharmacol. Exp. Ther.* 194(1):111-116, 1975.

The pharmacokinetics of pentobarbital, a barbiturate metabolized by the liver, was compared in ten normal and ten hepatectomized adult male Charles River rats immediately after hepatectomy. A mixture of 20 mg/kg of sodium pentobarbital and 4 μCi/kg of [2-^{14}C]-pentobarbital was injected into the jugular vein. Blood samples were taken from the carotid artery 1 to 210 min afterward and the pentobarbital blood concentration at each interval was determined. Pentobarbital excretion in the bile and urine was determined in five of the normal rats; the drug concentration in the liver, kidney, lung, brain, ileum, spleen, lumbodorsal fat, skin, abdominal muscle, and blood was determined one and ten min after injection in four normal rats. The blood concentration time curve after i.v. pentobarbital was fitted into a two-compartment open model. Both the volume of the central compartment and the elimination rate constant were significantly educed in the hepatectomized animals. The amounts of pentobarbital and its metabolites excreted into the bile and urine during the first four hr after i.v. injection were 1.5% and 26.1%, resp. Unchanged pentobarbital constituted 10.3% of the total drug in the bile and none of the drug in the urine. In the liver, kidney, spleen, brain, and intestine, the pentobarbital concentrations were higher than in the blood and were higher after one min than after ten min. In the fat, skin, and muscle, the pentobarbital concentrations were lower than those in the blood at one min, and were higher at ten min than at one min. Most of the drug present in the tissues ten min after injection was unchanged pentobarbital. The results indicate that pentobarbital is metabolized almost exclusively by the liver and that the urine contains only pentobarbital metabolites; the amount of drug excreted in the bile is very small.

8239 STUDY OF THE HEPATIC METABOLISM OF PRIMIDONE BY IMPROVED METHODOLOGY. *(E.)* Alvin, J.; Goh, E.; Bush, M. T. (Vanderbilt Univ. Sch. Medicine, Nashville, Tenn. 37232). *J. Pharmacol. Exp. Ther.* 194(1):117-125, 1975.

The metabolism of the anticonvulsant drug, primidone (PRM), in isolated perfused rat liver was studied by radiotracer methodology which permits nearly quantitative determination of the dose and its metabolites. Groups of four male Sprague-Dawley rats were pretreated with daily doses (50 mg/kg, i.p.) of PRM or phenobarbital for four days. Two untreated rats served as controls. Livers were perfused with

a blood-free medium containing Krebs-Ringer bicarbonate buffer, glucose, and bovine serum albumin. After 20 min of perfusion, [^{14}C]PRM was added to an initial concentration of 50 μg/ml; in most cases, unlabeled phenobarbital or phenylethylmalonamide (50 μg/ml) was added to the perfusate midway through the perfusion. Every 15 min, samples of the perfusate, the biliary output, and the liver were analyzed for PRM and its metabolites. Identification of ^{14}C-material was based on comparisons of thin-layer chromatography and countercurrent distribution and was quantitated by liquid-scintillation counting. Phenylethylmalonamide was the predominant metabolite of PRM (79%) in the livers of the nonpretreated rats; phenobarbital and its metabolites accounted for 18% of the PRM metabolized, and an unidentified metabolite accounted for 3%. PRM and phenobarbital pretreatment, particularly with the latter, accelerated PRM metabolism by the perfused livers. The $T_{\frac{1}{2}}$ values in the control, PRM-, and phenobarbital-pretreated groups were 92, 68, and 28 min, resp. The primary metabolite was phenylethylmalonamide, but phenobarbital production also increased proportionately. The introduction of nonlabeled phenylethylmalonamide to the perfusate produced an immediate reduction in the rate of PRM metabolism in all groups; addition of nonlabeled phenobarbital had no effect. It is concluded that the conversion of PRM to its active metabolites may be simultaneously influenced by the processes of metabolite inhibition (phenobarbital) and metabolite induction (phenylethylmalonamide).

8240 THE ROLE OF PLASMA AMINO ACIDS IN HEPATIC ENCEPHALOPATHY. *(E.)* Fischer, J. E.; Funovics, J. M.; Aguirre, A.; James, J. H.; Keane, J. M.; Wesdorp, R. I. C.; Yoshimura, N.; Westman, T. (Massachusetts General Hosp., Boston, Mass. 02114). *Surgery* 78(3):276-290, 1975.

An end-to-side portacaval shunt was performed on dogs to simulate the amino acid patterns of humans with chronic liver disease. A mixture of various amino acids was designed to normalize plasma amino acids in the hepatic encephalopathy, which resulted from the operation. The shunt was performed behind the highest branch of the portal vein. After surgery, the dogs were divided into three groups, and infusion with amino acid mixture was begun when the animals manifested encephalopathy. The dogs had lost an average of 12.4% of their initial body weight at this time. Group 1 was infused with isocaloric amounts of 23% dextrose, electrolytes and homologous dog plasma. Group 2 was infused with a commercially available solution of synthetic amino acid (nitrogen level was maintained to about 4 g protein/kg/day). Group 3 was infused with an isocaloric and isonitrogenous amount of a special formula (F080) mixed to normalize plasma amino acid levels. Two of the five dogs in group 1 died in typical hepatic encephalopathy. In group 2, all three of the animals died within five to 18 days. All of the dogs of group 3 that were originally in hepatic encephalopathy showed neurological improvement within 24 hr. All dogs of group 1 continued to lose weight and manifested a nitrogen balance of -2.2 g over 24 hr. Groups 2 and 3 showed no further weight loss, and their mean nitrogen balance was +3.4 g/24 hr and +3.2 g/24 hr, resp. No gross distortion in electrolyte balance was observed in any of the groups. Blood urea nitrogen was slightly higher in groups 2 and 3, and blood sugar was the highest in group 1. Serum ammonia rose in all animals after the operation and remained elevated until they were placed on total parenteral nutrition. Following the operation, plasma phenylalanine, tyrosine, tryptophan, and methionine were characteristically elevated and branched chain amino acids were decreased in dogs that developed encephalopathy. These patterns were not altered when infusion was begun in the first two groups, but were altered in group 3. Phenylalanine, tyrosine, and tryptophan returned toward normal, and leucine, isoleucine, and valine levels increased. The results suggest that normalization of plasma amino acids may be of value in controlling hepatic encephalopathy in animals and may lead to a better understanding of the mechanism of human hepatic encephalopathy.

8241 HEPATIC MICROSOMAL ETHANOL-OXIDIZING SYSTEM (MEOS): DISSOCIATION FROM REDUCED NICOTINAMIDE ADENINE DINUCLEOTIDE PHOSPHATE OXIDASE AND POSSIBLE ROLE OF FORM I OF CYTOCHROME P-450. *(E.)* Hasumura, Y.; Teschke, R.; Lieber, C. S. (Veterans Admin. Hosp., Bronx, New York, N. Y.). *J. Pharmacol. Exp. Ther.* 194(2):469-474, 1975.

The activities of the liver microsomal ethanol-oxidizing system (MEOS) and NADPH oxidase in female Sprague-Dawley rats were compared before and after treatment with ethanol, phenobarbital and CCl_4. The relation between MEOS activity and the content of three forms of cytochrome P-450 was also assessed. Chronic ethanol feeding to rats (a 4-5-week liquid diet containing ethanol, 36% of total calories) increased MEOS and NADPH oxidase activities by 102 and 62%, resp. Concomitantly, form I of cytochrome P-450 was increased by 88%. Acute administration of ethanol (withdrawal of chronic alcohol diet followed by 7.5 g/kg ethanol, intragastrically, for 6 hr) enhanced MEOS activity by 21% and form I of cytochrome P-450 by 20%. It had no effect on NADPH oxidase activity. Pretreatment of rats with phenobarbital (80 mg/kg, i.p. daily for 4 days) increased the specific activity of NADPH oxidase by 40%; MEOS activity remained unchanged. Administration of CCl_4 (0.5 ml/kg p.o.) did not change NADPH oxidase activity but reduced MEOS activity by 33%. It significantly decreased all three forms of cytochrome P-450: form I by 45%, form II by 56%, and form III by 24%. These results suggest that in the presence of NADPH, microsomes oxidize ethanol to acetaldehyde by a process involving form I of cytochrome P-450. Peroxide formation due to NADPH oxidase is not the rate-limiting step.

8242 BIOSYNTHESIS OF ACYL GROUPS IN MOLECULAR SPECIES OF BILIARY PHOSPHATIDYLCHOLINES DURING METABOLISM OF [2,2,2-$^2H_3$]ETHANOL. *(E.)* Curstedt, T. (Karolinska Inst., Stockholm, Sweden). *Biochim. Biophys. Acta.* 398(2):265-274, 1975.

The isotope content in different regions of the biliary phosphatidylcholine molecules and the isotopic composition of the 1-palmitoyl residues of different molecular species of phosphatidylcholines was measured following the i.p. injection of [2,2,2-$^2H_3$]ethanol into female bile fistula rats of the Sprague-Dawley strain. Beginning 48 hr after surgery, the ethanol was injected once every hr for 24 hr in volumes sufficient to maintain a biliary ethanol concentration of 10-30 mM. Bile was collected in 1 hr portions starting from the time of the first ethanol injection. The deuterium labeling of the glycerol moiety of the major molecular species (1 palmitoyl-2-oleoyl, 1-palmitoyl-2-linoleoyl, and 1-stearoyl-2-linoleoyl phosphatidylcholines) reached about 6-8 atom% after 24 hr of ethanol treatment. The deuterium excess at each of the different positions in the glycerol moiety of 1-palmitoyl-2-linoleoyl phosphatidylcholine was less than 3 atom%. The deuterium content in the palmitoyl residues of 1-palmitoyl-2-oleoyl and 1-palmitoyl-2-linoleoyl phosphatidylcholine increased during ethanol administration, as did the amount of deuterium in the palmitoyl residues of the 1-palmitoyl-2-arachidonoyl species. The deuterium excess of the steroyl residue of 1-steroyl-2-linoleoyl phosphatidylcholine was only 1/3 that of the palmitoyl residues, and no deuterium was found in the oleoyl residue of 1-palmitoyl-2-oleoyl phosphatidylcholine. From the isotopic composition of the palmitoyl residues of the phosphatidylcholines, it was estimated that the labeled ethanol supplied about 35-40% of the acetyl-CoA forming the terminal methyl group and about 25-30% of the other C_2 units of the palmitic acid chain. This difference in deuterium incorporation is attributed to an isotope effect, probably in the rate-limiting carboxylation step of acetyl-CoA. Most, if not all, of the acetyl groups derived from ethanol were introduced into the terminal methyl group without loss of deuterium. The results indicate that ethanol is a very important precursor of the acetyl-CoA used in lipid synthesis, and that citrate is not.

8243 ETHANOL INDUCED ALTERATION OF MICROSOMAL MEMBRANE BOUND ENZYMES OF RAT LIVER IN VITRO. *(E.)* Marniemi, J.; Aitio, A.; Vainio, H. (Dep. Physiol., Univ. Turku, Finland). *Acta Pharmacol. Toxicol.* 37(3):222-232, 1975.

The effects of ethanol (0-4.90 mol/liter) on rat liver microsomal mono-oxygenase (*p*-nitroanisole O-demethylase and aryl hydrocarbon hydroxylase), UDP-glucuronosyltransferase (*p*-nitrophenol and 4-methylumbelliferone), and glucose 6-phosphatase activities were studied *in vitro* using the nontreated, trypsin-digested, and detergent-treated liver microsomes from normal, 3,4-benzpyrene- (20 mg/kg p.o. for 3 days), and phenobarbital- (80 mg/kg p.o. for 5 days) treated male Wistar rats. In the preparations from the untreated control rats, ethanol (0.34 mol/liter and above) inhibited *p*-nitroanisole O-demethylase and, to a lesser extent, aryl hydrocarbon hydroxylase. Inhibition, especially of aryl hydrocarbon hydroxylase, was less pronounced in microsomal preparations from the 3,4-benzpyrene-treated rats. In the untreated and detergent-treated microsomes from the control and drug-treated rats, ethanol (2.45 mol/liter) stimulated the activity of UDP-glucuronosyltransferase, while higher concentrations (4.90 mol/liter) of ethanol inhibited this enzyme. In trypsin-digested microsomes from control and 3,4-benzpyrene-treated animals, ethanol at 2.45 mol/liter did not inhibit glucuronidation of *p*-nitrophenol, but in the preparations from the phenobarbital-treated animals, ethanol at this concentration inhibited the activity by almost 50%. At concentrations of 4 mol/liter, ethanol inhibited the activity of glucose 6-phosphatase in the untreated microsomes from control and drug-treated rats. Trypsin and digitonin treatment increased the measurable enzyme activity to almost twice the original value, but cetylpyridinium chloride treatment slightly reduced the activity. Treatment of the microsomes with detergent or trypsin had no significant effect on the response of glucose 6-phosphatase to ethanol. The results suggest that the ethanol-sensitive component of the mono-oxygenase system is cytochrome P-450, that the activating effect of ethanol on UDP-glucuronosyltransferase is due to membrane perturbation, and that UDP-glucuronosyltransferase is deeply embedded behind a permeability barrier in the membrane compartment.

8244 EFFECTS OF ALCOHOL ON BILIARY LIPIDS IN THE PRESENCE OF A CHRONIC BILIARY FISTULA. *(E.)* Marin, G. A.; Karjoo, M.; Ward, N.; Rosato, E. (Philadelphia Gen. Hosp., Pa.). *Surg. Gynecol. Obstet.* 141(3):352-356, 1975.

The effects of acute parenteral alcohol administration (1.5 g/kg in the first hr followed by 0.18 mg/kg/hr for the next 2 hr, perfused at a rate of 20 ml/hr) on the volume and composition of the bile was studied in chronic fistula mongrel dogs during partial interruption of the enterohepatic circulation of bile salts and during repletion of the enterohepatic circulation by continuous i.v. taurocholate sodium infusion (1.5 μM/kg/min). There was no evidence of intravascular hemolysis during these experiments. Alcohol administration was associated with a rise in the basal serum osmolality (from 295 mOsM/liter to 353 mOsM/liter), but with no change in the bile osmolality. The magnitude of interruption of the enterohepatic circulation increased with time, the overall interruption fluctuating between 25% and 50%. During alcohol administration, the blood and bile alcohol concentrations remained above 160 mg/ml throughout the experiment. Alcohol administration produced significantly decreased bile volume and total bile salt and cholesterol outputs; the phospholipid output was not affected. During continuous taurocholate infusion, alcohol failed to elicit changes in the biliary volume or in the output of bile salts. The decrease in cholesterol output, however, was not prevented by bile salt administration, and no significant changes occurred in the phospholipid output. Thus, alcohol causes significant changes in bile flow and biliary lipid composition. These findings are consistent with the existence of a bile salt-independent fraction of cholesterol secretion in the dog. The alcohol-stimulated fraction of bile formation was probably canalicular in origin.

8245 EFFECTS ON LIPIDS, COAGULATION FACTORS AND LIVER HISTOLOGY OF LONG-TERM ETHANOL ADMINISTRATION TO GUINEA-PIGS. (E.) Wallerstedt, S.; Olsson, R.; Korsan-Bengtsen, K. (Medical Clinic II, Sahlgrenska Hosp., Univ. Göteberg, Sweden). *Acta Hepatogastroenterol.* 22(4):236-241, 1975.

The reaction of liver to prolonged ethanol administration was studied in guinea pigs. The animals were divided into two groups; one group (18) received 20% v/v ethanol in the drinking water, while the second group (13 controls) received an isocaloric concentration of glucose in the drinking water. During the following 8 months, the caloric intake from ethanol amounted to 40.5% of the total calories or 10.6 g of ethanol/kg. After an initial accommodation period, the body weights increased steadily in the control group, but remained relatively constant in the ethanol group. Triglyceride and cholesterol levels increased in the liver and serum. The persistence of liver triglyceride increase in spite of the low fat content of the diet was in contrast to experiences in the rat. A slight depression of coagulation factors II, VII, X, and XI was observed in the ethanol-fed rats. No alcoholic cirrhosis or hepatitis developed, which indicates that the guinea pig, like the rat and the rabbit, is not suitable for studies of the pathogenesis of chronic liver disease seen after chronic alcohol consumption in man.

8246 STUDIES ON THE TOXICITY OF SULFATED AND NONSULFATED BILE ACIDS. *(Ger.)* Czygan, P.; Stiehl, A. (Medizinische Universitatsklinik Heidelberg, D-6900 Heidelberg, Germany). *Z. Gastroenterol.* 13(4):468-473, 1975.

The hepatotoxicity of taurolithocholic (TLC) and taurochenodeoxycholic (TCDC) acids and their sulfate esters was studied in male Wistar rats 1 to 24 hr after administration of a single dose of 100 mg/kg, i.v. in an albumin solution. Controls received only the albumin solution. TLC increased serum bilirubin concentrations to 0.8 ± 0.2 mg/100 ml after one hr, to 1.0 ± 0.3 mg/100 ml after four hr, to 4.6 ± 0.3 mg/100 ml after 12 hr, and to 0.6 ± 0.2 mg/100 ml after 24 hr. Neither TLC sulfate, TCDC, nor TCDC sulfate had any effect on serum bilirubin levels. Lipoprotein X was only positive in rats treated 12 hr previously with TLC. A 15- to 16-fold increase in SGPT and a 14-fold increase in SGOT occurred 12 hr after administration of TLC, while TCDC caused five-to six-fold increases in these two enzymes after 12 hr. The sulfate esters of TLC and TCDC had no effect on either SGOT or SGPT. In contrast to *in vitro* studies, which showed that low concentrations of both TLC and TCDC competitively inhibit oxidative aminopyrine demethylation in rat liver microsomes and higher concentrations destroy the enzyme system, oxidative demethylation of aminopyrine was significantly inhibited only in microsomal preparations from rats treated with TLC. Aminopyrine demethylation in microsomes from rats given TLC sulfate, TCDC, or TCDC sulfate did not differ significantly from that in control preparations. Neither of these bile acids nor their sulfates had any effect on aniline hydroxylation, either *in vitro* or in microsomes from rats to which they had been administered. These results indicate that the sulfate esters of TLC and TCDC are not hepatotoxic in rats.

8247 EFFECTS OF CHLORPROMAZINE ON BILIRUBIN METABOLISM AND BILIARY SECRETION IN THE RAT. *(E.)* Knodell, R. G. (Walter Reed Army Medical Center, Washington, D.C. 20012). *Gastroenterology* 69(4):965-972, 1975.

The effects of acute and chronic chlorpromazine administration on bilirubin metabolism and biliary secretion in the rat were investigated in an attempt to define the mechanisms involved in chlorpromazine hepatotoxicity. In acute experiments, 5 to 25 mg/kg of chlorpromazine were given i.v.; in chronic experiments, Walter Reed rats received 25 mg/kg of chlorpromazine i.p. for four or eight days. Acute treatment (25 mg/kg) produced hemolysis and resulted in increased bilirubin output and stimulation of hepatic heme synthesis. Unconjugated bilirubin appeared in bile together with a γ-azopigment that is found in biliary obstruction in both the rat and man. Acute infusion of hemoglobin solutions to stimulate the hemolysis produced by acute chlorpromazine treatment resulted in increased bilirubin output and increased heme synthesis, but no alterations were seen in the normal conjugation pattern of bilirubin in bile. Chronic chlorpromazine treatment for four and eight days increased bilirubin output without elevating plasma hemoglobin levels, and increased the fraction of monoconjugated bilirubin in bile; treatment for eight days also led to the appearance of unconjugated bilirubin in bile. No change in liver weight, bile salt, phospholipid, or cholesterol output was seen with chronic chlorpromazine therapy. Changes in bilirubin conjugation produced by chlorpromazine may provide a significant clue to chlorpromazine-induced cholestasis. Both unconjugated and monoconjugated bilirubin may be less soluble in bile than the disconjugated bilirubin and could lead to formation of biliary sludge or precipitation of bilirubin in the canaliculi. Such a precipitate could either directly produce the cholestatic lesion characteristic of chlorpromazine injury or initiate an inflammatory or immunologic response leading to cholestasis.

8248 EFFECTS OF CITRATE AND TIADENOL ON PHYSICOCHEMICAL EQUILIBRIUM OF BILE IN RATS. *(E.)* Rozé, C.; Vaille, C.; Souchard, M.; de La Tour, J.; Debray, C. (Hôpital Bichat, Paris, France). *Digestion* 12(2):114-117, 1975.

Bile salts, cholesterol, and phospholipids were determined in bile collected from Wistar rats after one or four weeks of feeding of standard diets containing 20% Na and K citrates, 0.5% tiadenol (a hypolipemic factor), or tiadenol plus citrates. Liver weight and blood cholesterol were also measured. Liver weight did not change after citrate alone and increased less with the mixed diet than with tiadenol alone. The bile salt concentration increased with citrate (55% after 1 wk, 49% after 4 wk) and with the mixed diet; it was not changed

after one week of tiadenol and was slightly decreased after four weeks of tiadenol. Phospholipid levels increased slightly with citrate and more with citrate than with the mixed diet. Tiadenol had no effect. Bile cholesterol concentrations decreased after tiadenol inclusion (45% after 1 wk, 70% after 4 wk), did not change or decreased slightly with citrate use alone, and were unaffected by the mixed diet. The mean value of the cholesterol solubility ratio (bile salts + phospholipids/cholesterol) increased in all treatment groups. With the mixed diet, the ratio did not increase any more than in each of the groups receiving a single drug. Thus, no potentiation is obtained in a diet containing both factors.

8249 HEPATIC, VASCULAR AND BILIARY RESPONSES TO INFUSION OF GASTROINTESTINAL HORMONES AND BILE SALTS. *(E.)* Post, J. A.; Hanson, K. M. (Ohio State Univ. Coll. Medicine, Columbus, Ohio). *Digestion* 12(2):65-77, 1975.

The effects of secretin, cholecystokinin, synthetic pentagastrin, sodium dehydrocholate, and sodium taurocholate on hemodynamics of the canine liver were studied in 57 dogs. Dehydrocholate (30.6 mg/min, i.v.) and cholecystokinin (2.73 U/min, i.v.) significantly decreased systemic arterial pressure while the other substances did not. The systemic arterial pressure declined from 120 ± 6 to 105 ± 6 mm Hg after 60 min of dehydrocholate infusion and from 121 ± 5 to 113 ± 5 mm Hg after a 30-min cholecystokinin infusion. Hepatic arterial vessels were dilated by pentagastrin (10 µg/kg/hr, i.v.) and the bile salts; however, flow was not increased in the latter case. Intrahepatic portal venous resistance was decreased by pentagastrin and increased by bile salts. Portal flow was decreased by the bile salts and increased by pentagastrin. Apart from this, mean changes in portal venous flow and portal pressure were not statistically significant. All the substances infused were potent choleretic agents except pentagastrin which produced a relatively small, transient increase in bile flow. It is concluded that marked bile-flow increases may occur even in the presence of decreased liver blood flow.

8250 EFFECT OF INSULIN ON ALBUMIN PRODUCTION AND INCORPORATION OF ^{14}C-LEUCINE INTO PROTEINS IN ISOLATED PARENCHYMAL LIVER CELLS FROM NORMAL RATS. *(E.)* Dich, J.; Gluud, C. N. (Dept. Biochemistry A, Panum Inst., Univ. Copenhagen, Copenhagen, Denmark). *Acta Physiol. Scand.* 94(2): 236-243, 1975.

The *in vitro* effect of insulin (10^{-6} to 10^{-10} M) on albumin production and on the incorporation of ^{14}C-leucine (0.5 µCi) into secreted proteins (proteins found in the medium) and cell proteins was studied in isolated liver parenchymal cells from normal female Wistar rats. The liver cells were isolated by a modified collagenase method and were incubated in Hanks solution containing glucose, HEPES, amino acids, bovine serum albumin, L-[U-^{14}C]leucine, and insulin or solvent. The addition of insulin to the incubation medium significantly increased immunologically measured albumin production and the incorporation of labeled leucine into albumin; the effect was dose dependent. Insulin increased albumin production 50% at 10^{-6} M, 21% at 10^{-8} M, 16% at 10^{-9} M, and 17% at 10^{-10} M. The incorporation of labeled leucine was increased by 50%, 21%, 11%, and 8% at insulin concentrations of 10^{-6} M, 10^{-8} M, 10^{-9} M, and 10^{-10} M, resp. The effects on the two parameters were positively correlated. The increment in the medium and cell suspension rat albumin concentrations increased linearly with time, as did the incorporation of leucine into albumin. A lag of 15 to 20 min was observed before labeled albumin appeared in the medium. The intracellular albumin level remained nearly constant at 109 µg/g liver. The incorporation of ^{14}C-leucine into proteins secreted into the medium was also enhanced by insulin (10^{-6} to 10^{-10} M of insulin increased secretion by 40 to 9%), as was the incorporation into cell proteins (10^{-6} to 10^{-10} M increased incorporation 20 to 8%). The time course of leucine incorporation into proteins secreted into the medium was similar to that of the incorporation into albumin; incorporation into proteins in the cell suspension started immediately after addition of the tracer and proceeded linearly for 60 to 75 min, a plateau being reached after about 90 min. The data suggest a direct effect of insulin on the synthesis of albumin.

8251 OUTPUT OF BILIRUBIN AND PANCREATIC ENZYMES IN RESPONSE TO DIFFERENT LIQUID TEST MEALS IN MAN. *(E.)* Ekelund, K.; Johansson, C. (Karolinksa Hosp., Stockholm, Sweden). *Scand. J. Gastroenterol.* 10(5):507-511, 1975.

The outputs of bilirubin and pancreatic enzymes in 23 healthy subjects (18 men and 5 women, aged 21-32 yr) were examined after ingestion of three different liquid test meals. Two groups of subjects were given composite meals differing in their protein content (3.6 or 7.2% skim milk protein) but containing identical amounts of lactose, glucose, corn oil, and polyethylene glycol test marker. The third test meal was a 15% glucose solution. The emptying rate of fat and sugar was approximately equal after both composite meals but that of protein was faster after the high-protein meal. The delivery of more protein per unit time to the intestine was followed by a higher output of bilirubin and pancreatic enzymes (amylase, lipase, and trypsin). After ingestion of the 15% glucose solution, the output of pancreatic enzymes and bilirubin increased considerably for the first hour but then declined. After all meals, the initial pancreatic and biliary responses were higher than during the subsequent two hr. This is due to the rapid early delivery of food constituents to the intestine and/or volume distension of the stomach and the intestine. The differences in enzyme and bilirubin output corresponded to differences in quality and quantity of the emptied food components.

8252 BILIRUBIN AS A CHOLESTATIC AGENT. III. PREVENTION OF BILIRUBIN-RELATED CHOLESTASIS BY SULFOBROMOPHTHALEIN. *(E.)* Witzleben, C. L.; Boyce, W. H. (Univ. Pennsylvania Medical Sch., 36th and Hamilton Walk, Philadelphia, Pa. 19104). *Arch. Pathol.* 99(9):492-495, 1975.

The effects of BSP on manganese-bilirubin-induced cholestasis were studied in male Sprague-Dawley rats. The animals were fasted after i.v. manganese administration, bile collection being started 4 hr later. Bilirubin (10 ml, given i.v. at a rate of 0.33 ml/min) was administered continuously and BSP (2.5 ml, i.v. at a rate of 0.33 ml/min) was infused intermittently beginning 5 to 10 min after bile collection; the two agents were given either simultaneously or separately. Bilirubin alone caused a marked drop in bile flow rate in the manganese-loaded rats, while BSP alone caused a mild choleresis. When given simultaneously with the bilirubin, BSP effectively prevented the manganese-bilirubin cholestasis. When the rats were killed ten min after the beginning of bilirubin infusion (i.e., in the immediate precholestatic interval), the bilirubin levels in the blood were higher in the BSP-treated animals; the levels in the liver were the same in the BSP-treated and nontreated animals; and levels in the bile were reduced in the BSP-treated animals. Increasing the bilirubin load while keeping the BSP load unchanged tended to reinstate the cholestasis and increased the bile bilirubin concentration significantly. When serial bile bilirubin concentrations were determined over a 70-min period of continuous cannulation, the levels rose rapidly to similar values in the presence of differing bilirubin loads. Thus, BSP did not prevent cholestasis through an effect on the total biliary bilirubin concentration *per se*. It is likely that the anticholestatic activity of this agent is related to an ability to prevent manganese-bilirubin interaction, or to an ability to prevent the binding or reaction of bilirubin and manganese with some critical intracellular organelle or metabolite.

8253 BILIRUBIN AS A CHOLESTATIC AGENT. IV. EFFECT OF BILIRUBIN AND SULFOBROMOPHTHALEIN (BSP) ON BILIARY MANGANESE EXCRETION. *(E.)* Witzleben, C.; Boyce, W. H. (Univ. Pennsylvania Medical Sch., 36th and Hamilton Walk, Philadelphia, Pa. 19104). *Arch. Pathol.* 99(9):496-498, 1975.

The basic pathogenesis of the cholestasis induced by manganese-bilirubin overload in the rat was studied. Male Sprague-Dawley rats were injected with manganese, fasted, and subjected to bile duct cannulation. Ten min later, i.v. bilirubin infusion (10 ml of a 75 mg/100 ml solution) was started, or the animals were infused with a BSP solution (2.5 mg/kg in 2.5 ml infusate over a 30 min period). The bile was collected in manganese-free polyethylene tubes. Bilirubin caused an increase in the manganese concentration in the bile but had no effect on the total amount of manganese excreted in the bile. When the bile from the animals treated with bilirubin and manganese was allowed to stand, a precipitate containing a small amount of manganese (1.3 µg/10 min bile collection) formed. BSP caused a significant increase in both the biliary manganese concentration and the total amount of manganese excreted in the bile. Thus, BSP induced a real increase in biliary manganese excretion. The data appear to indicate that the concentration of manganese *per se* in the bile is not a critical determinant in the development of manganese-bilirubin cholestasis.

8254 INFLUENCE OF DIETARY LIPIDS ON IRON AND COPPER LEVELS OF RATS ADMINISTERED ORAL CONTRACEPTIVES. *(E.)* Onderka, H. K.; Kirksey, A. (Dept. Foods and Nutrition, Purdue Univ., W. Lafayette, Indiana 47907). *J. Nutr.* 105(10):1269-1277, 1975.

The relation between oral contraceptives (OC) and dietary lipids as compared to iron and copper levels in the plasma and tissues of rats was investigated. In experiment I, 128 female Wistar rats were divided into four groups of 32 rats each. For 15 wk two groups were fed a diet containing 20% safflower oil and two groups received a diet of hydrogenated 20% coconut oil. Cholesterol (0.5%) was included in diets fed to one-half of the groups fed either safflower or coconut oil. For four additional wk, three OC agents (Ovulen, Provest and Enovid) were randomly administered to three groups of eight animals in each of the four dietary regimens. The effectiveness of an OC was determined by daily vaginal smears. In experiment II, 28 females were divided evenly into four groups: group I received a control diet plus 20% safflower oil; group II received a control diet plus 0.5% sodium glycocholate; group III received a control diet plus 0.5% cholesterol; and group IV received a control diet plus 0.5% sodium glycocholate and 0.5% cholesterol. All diets were fed for seven wk. In both experiments, blood, liver, kidney, spleen and fecal iron and copper levels were determined by atomic absorption. Blood copper oxidase (CO) activity was measured and used to calculate ceruloplasmin concentration. Hemoglobin was measured as cyanohemoglobin and RBC concentration by a hemacytometer. The OC treatment caused an overall 11% reduction in food consumption. There was no significant difference in hemoglobin level, hematocrit, RBC concentration, mean cell volume, iron or copper levels in plasma. The type of dietary fat had no significant influence on plasma iron, copper, ceruloplasmin or other hematological indices. Rats fed cholesterol had significantly lower plasma iron but increased plasma copper due to an increase in ceruloplasmin. The livers of rats on cholesterol were fatty, pale yellow and larger than those not fed cholesterol. Cholesterol in the diet also increased spleen size by 11%. The effect of cholesterol on liver size was intensified by safflower oil. The OCs affected tissue iron or copper levels only in the liver. Animals fed OC, cholesterol and safflower oil had higher liver copper than those with OC fed either oil without cholesterol. Sodium glycocholate increased iron absorption from 18.2 to 82.4%. Cholesterol alone depressed iron absorption to 7.5% but in addition to sodium glycocholate there was a 23% iron absorption. The areas most responsive to changes in

dietary lipid appear to be the liver and kidneys with copper levels being most sensitive to dietary and/or hormonal changes.

8255 HEPATIC DRUG METABOLISM IN RETINOL-DEFICIENT RATS. *(E.)* Colby, H. D.; Kramer, R. E.; Greiner, J. W.; Robinson, D. A.; Krause, R. F.; Canady, W. J. (West Virginia Univ. Sch. Med., Morgantown). *Biochem. Pharmacol.* 24(17): 1644-1646, 1975.

The effects of retinol deficiency on hepatic oxidative metabolism were studied in disease-free, weanling male Wistar rats. Control, retinol-deficient, and retinol supplemented (6 mg/kg diet) retinol-deficient animals were fasted prior to sacrifice. Liver microsomal suspensions from these animals were analyzed for protein, retinol, and cytochrome P-450 contents and for oxidative metabolism. The body weights, liver weights, and hepatic microsomal retinol, protein, and cytochrome P-450 contents were lower in the retinol-deficient rats than in retinol-supplemented and control animals. The hepatic metabolism of ethylmorphine (demethylation) and aniline (hydroxylation), whether expressed per unit tissue weight or per mg microsomal protein, was also significantly impaired in the retinol-deficient animals as compared with the other 2 groups. Retinol deficiency reduced the binding affinities of cytochrome P-450 for ethylmorphine and hexobarbital, but increased those for ethylbenzene and naphthalene; these changes were completely reversed by retinol supplementation. The *in vitro* addition of retinol to hepatic microsomes from retinol-deficient rats further lowered oxidative metabolism. The spectral dissociation constants for hydrocarbon or drug substrates in the hepatic microsomes were unaffected by similar concentrations of retinol *in vitro*. The data indicate that retinol is required for the maintenance of normal hepatic cytochrome P-450 levels and oxidative metabolism. Since none of the changes caused by retinol deficiency could be reversed by addition of retinol to hepatic microsomes, the decrease in the rate of drug metabolism in retinol-deficient rats is apparently due to an overall reduction in the hepatic microsomal protein content, a fall in the specific activity of oxidative enzymes, and changes in the hemoprotein content. The results are also consistent with an increase in the hydrophobicity of cytochrome P-450 in retinol-deficient animals.

8256 FATTY LIVER INDUCED BY TETRACYCLINE IN THE RAT. DOSE-RESPONSE RELATIONSHIPS AND EFFECT OF SEX. (*E.*) Breen, K. J.; Schenker, S.; Heimberg, M. (Vanderbilt Univ. Sch. Medicine, Nashville, Tenn.). *Gastroenterology* 69(3):714-723, 1975.

Dose-response relations, biochemical mechanisms and sex differences in experimental fatty liver induced by tetracycline were studied in intact and isolated perfused rat liver of male and female (pregnant and non-pregnant) Sprague-Dawley rats. In the intact rats, tetracycline (100 mg/kg) caused an increase in the triglyceride content; no dose-dependent relation was noted. In isolated perfused liver (both males and females) with adequate oleic acid as the substrate, a direct relation was observed between tetracycline dose and both hepatic triglyceride accumulation and depression of triglyceride output. Hepatic triglyceride output and concentrations were markedly different in male and female rats with regard to base line concentrations. However, in all treated animals the percent increase in hepatic triglyceride concentrations was similar. Livers from females, especially pregnant ones, were more resistant to the effect of tetracycline. These differences between the sexes could not be related to the altered disposition of tetracycline or oleic acid uptake. Tetracycline had no effect on the hepatic concentrations of phospholipids, cholesterol, glucose or ketone body output. Depressed hepatic secretion of triglyceride accounted for 30 to 50% of accumulated hepatic triglyceride, indicating that additional mechanisms must be involved in the production of triglyceride-rich fatty liver in response to tetracyline.

8257 STIMULATION OF RAT LIVER ADENYLATE CYCLASE BY HALOTHANE. *(E.)* Rosenberg, H.; Pohl, S. (Univ. Pennsylvania Sch. Med., Philadelphia). *Life Sci.* 17(3):431-434, 1975.

The effects of halothane (0-40 mg/100 ml in the liquid phase) on basal, glucagon-stimulated (5×10^{-5} M), and sodium fluoride-stimulated (20 mM) adenylate cyclase activity were determined by using a highly purified plasma membrane preparation from the livers of female Sprague-Dawley rats. The membranes were prepared by a modification of the procedure of Neville and were exposed to halothane for 10 min prior to the determination of adenylate cyclase. Basal adenylate cyclase activity was stimulated by about 25% at halothane concentrations up to 30 mg/100 ml. Higher concentrations increased enzyme activity even further. Glucagon-stimulated adenylate cyclase activity was augmented at all halothane concentrations greater than 30 mg/100 ml, whereas sodium fluoride-stimulated activity was significantly increased only by concentrations of 30-40 mg/100 ml. The data indicate that halothane in clinical and toxic concentrations is a direct stimulant of adenylate cyclase.

8258 ANIMAL EXPERIMENTS ON LIVER INJURY FOLLOWING HALOTHANE ANESTHESIA AND HYPOXIA. *(Ger.)* Kramer, M.; L'Allemand, H. (Zentrum Chirurgie, Justus-Liebig-Universitat, D-6300 Giessen, Klinikstr. 37, Germany). *Anaesthesist* 24(3):107-111, 1975.

Activities of glutamate-oxalate transaminase (GOT), glutamate-pyruvate transaminase (GPT), glycerophosphate, glucose dehydrogenase (GLDH), creatine phosphokinase, leucine aminopeptidase (LAP), alkaline phosphatase, cholinesterase (ChE), LDH, and α-hydroxybutyrate dehydrogenase were measured in serum and liver homogenate samples from 197 female BR46 Wistar II rats, 40 and 60 hr after 4-hr exposures to anesthesia and/or hypoxia and from 73 rats

who were untreated controls. Of the 197 rats, (1) 44 were given a mixture of 12% O_2 and 88% nitrous oxide (hypoxia group); (2) 50 received 0.5 volume % halothane mixed with 50% O_2 and 50% nitrous oxide; (3) 50 were treated the same as rats in group 2 but under hypoxic conditions; and (4) 40 were anesthetized three times at five-day intervals under normal and hypoxic conditions. No significant changes were observed in serum from rats in group 2, 40 hr after anesthesia, but GOT, GPT, and ChE activities in liver homogenate were significantly decreased. Serum GPT and GLDH activities were significantly increased 40 hr after the last exposure to halothane under normal conditions in rats in group (4). These changes were even more pronounced in liver homogenates in which GOT, GLDH, LAP, and ChE activities were significantly increased over control values. If these animals were sacrificed at 60 hr, rather than 40 hr after their last exposure to halothane, enzyme activities tended to normalize: serum GLDH was still increased and ChE decreased, while liver GOT and LAP were increased. Reduction of the amount of O_2 administered from 50% to 12% had no effect on enzyme activities in either the serum or liver. No significant differences were observed between animals in group 4 who were anesthetized under normal conditions and those anesthetized under hypoxic conditions. However, if O_2 was reduced from 12% to 8% and given in combination with halothane, almost all animals died of heart failure.

8259 THE EFFECTS OF IRON DEFICIENCY ON RAT LIVER ENZYMES. *(E.)* Bailey-Wood, R.; Blayney, L. M.; Muir, J. R.; Jacobs, A. (Welsh Natl. Sch. Med., Cardiff). *Br. J. Exp. Pathol.* 56(3): 193-198, 1975.

The effects of iron deficiency on electron transport and mitochondrial and microsomal reductase systems in rat liver were studied in male animals started at age 3 weeks on iron deficient (1-2 mg/kg) and iron supplemented (180 mg/kg) diets. The animals were fasted and killed at age 7 or 14 weeks and the activities of NADH-cytochrome C reductase, NADH-ferricyanide reductase, succinate-cytochrome C reductase, succinate-ferricyanide reductase, cytochrome oxidase, cytochrome P-450, 6-phosphogluconate dehydrogenase, and glucose 6-phosphate dehydrogenase were determined in the liver mitochondrial, microsomal, and supernatant fractions. Determinations were also made of body and liver weight, hemoglobin content, serum iron, total iron binding capacity, transferrin saturation, and liver nonheme iron. Serum iron concentrations, transferrin saturation, and liver nonheme iron were significantly decreased and the total iron binding capacity was elevated in the iron-deficient animals at 7 and 14 weeks. The body and liver weights of the iron-deficient animals were also significantly reduced, although the liver weight/body weight ratio remained unchanged. The microsomal, but not the mitochondrial, activities of NADH-cytochrome C reductase and NADH-ferricyanide reductase were significantly reduced (by about 35%) in iron-deficient animals at age 14 weeks. At 14 weeks, but not at 7, the succinate-cytochrome C reductase values were decreased to about 1/2 of normal values in the iron-deficient rats. There was no decrease in succinate-ferricyanide reductase or cytochrome oxidase activity or in the cytochrome P-450 concentration. At 7 weeks, 6-phosphogluconate and glucose 6-phosphate dehydrogenase activities in the soluble fraction were decreased by 51 and 53%, resp., in iron-deficient rats. At 14 weeks, the activity of glucose 6-phosphate dehydrogenase in the iron-deficient rats was 45% lower than normal values, but the activity of 6-phosphogluconate dehydrogenase in the normal animals had decreased to the level found in the iron-deficient animals. Thus, microsomal and mitochondrial reductases and the components of the mitochondrial electron transport pathway are affected to varying degrees and, in some cases, perhaps indirectly, by iron deficiency.

8260 THE ROLE OF IRON IN THE PATHOGENESIS OF PORPHYRIA CUTANEA TARDA. *(E.)* Kushner, J. P.; Steinmuller, D. P.; Lee, G. R. (Veteran's Admin. Hosp., Salt Lake City, Utah 84132). *J. Clin. Invest.* 56(2):661-667, 1975.

The effect of iron on uroporphyrinogen decarboxylase (URODECARB) activity in pig crude liver extracts was studied. Mitochondria-free liver extracts were incubated for two hr at 37 C with 6.7 mM of cysteine in Tris-HCl buffer, with experimental samples containing ferrous ammonium sulfate (0.7 mM Fe). URODECARB was assayed using a modified method of Romeo and Levin. The reaction products, porphyrinogens, were analyzed by three methods: solvent extraction, paper chromatography-liquid scintillation, and thin layer-liquid scintillation. In the solvent extraction method, neither cysteine nor iron alone had any effect on URODECARB activity, but in combination they produced a mean of 44% inhibition (from 0.23 to 0.13 U/mg of protein). The results were similar with the paper chromatography-liquid scintillation method, with iron causing a 41% reduction in URODECARB activity (from 0.39 to 0.22 U/mg of protein). In the thin layer-liquid scintillation method, the effect of iron varied with the substrate used: when uroporphyrinogen I was the substrate, iron caused a 40% reduction in URODECARB activity (from 0.77 to 0.46 U/mg of protein); but when uroporphyrinogen III was used, there was only a 24% reduction (from 0.79 to 0.60 U/mg of protein). The inhibition of URODECARB activity by iron was demonstrated by all three methods, with the thin layer method giving the highest specific activity. Iron overload does not induce porphyrin cutanea tarda (PCT), but PCT patients may have an unusual sensitivity to the effects of iron. The study suggests that PCT occurs in patients with a genetically determined abnormality in URODECARB activity and that the condition may remain latent until excessive hepatic iron stores are accumulated.

8261 MANGANESE INDUCED HEPATIC LESIONS IN CARBON TETRACHLORIDE PRETREATED RATS. *(E.)* Chandra, S. V.; Saxena, D. K. (Industrial Toxicology Res. Center, Lucknow, India). *Exp. Pathol.* 10(5/6):285-288, 1975.

Manganese induced cirrhosis was produced in carbon

tetrachloride pretreated rats. Forty-six male albino rats were divided into four experimental groups: group I (10 rats) served as controls; group II (10 rats) was given 6 mg/kg $MnSO_4 \cdot 4H_2O$, i.p. daily for 30 days; group III (16 rats) was given CCl_4 (1 ml/kg), p.o., every third day for ten feedings, and two rats were sacrificed one day after last feeding and the rest were given $MnSO_4 \cdot 4H_2O$ (6 mg/kg) i.p. daily for 30 days; and group IV (10 rats) was given CCl_4 as above (10 doses) and then injected, i.p., with saline (0.5 ml) daily for 30 days. Histological and histochemical studies revealed no gross abnormality in any organs, either in the control animals or the $MnSO_4 \cdot 4H_2O$-treated rats. The livers of CCl_4-treated animals were soft and pale while manganese sulfate-treated livers showed marked congestion. The CCl_4-treated livers showed moderate degree of fatty change and degeneration of cells around central veins with slightly increased cellularity around portal tracts. Manganese sulfate-treated livers showed mild congestion of central veins and adjacent sinusoids, and mild bile duct proliferation. Manganese treatment after CCl_4 treatment induced persistent fatty change of cells surrounding central veins. Large areas of focal necrosis with degenerated hepatocytes, inflammatory cells and hyperplasia of Kupffer cells were also evident. Administration of manganese sulfate for 30 days did not damage hepatocytes; however, the same amount of metal in already damaged livers will produce degeneration and necrotic changes in the parenchyma. This extensive damage produced by manganese in CCl_4-pretreated rats may be due to increased manganese absorption and storage in the injured liver. It was suggested that workers handling manganese and having liver dysfunction may be more susceptible to manganese toxicity.

8262 EFFECTS OF DIFFERENT VITAMIN E-DEFICIENT BASAL DIETS ON HEPATIC CATALASE AND MICROSOMAL CYTOCHROMES P-450 AND b_5 IN RATS. *(E.)* Hauswirth, J. W.; Nair, P. P. (Sinai Hosp., Baltimore, Md. 21215). *Am. J. Clin. Nutr.* 28(10):1087-1094, 1975.

The effects of commonly used formulations of vitamin and mineral supplements on hepatic hemeproteins were studied in male Sprague-Dawley rats maintained for 6 or 12 weeks on a basal, vitamin E-deficient diet consisting of 70% sucrose, 20% vitamin-free casein, and 4% tocopherol-stripped lard. This diet was supplemented with 4% United States Pharmacopoeia (USP) salt mixture XIV and 2% tocopherol-free NBC vitamin fortification mixture, 4% USP salt mixture XIV and 2% vitamin fortification mixture (tocopherol-free) according to Weglicki, 4% Briggs' salt mixture and the Weglicki vitamin fortification mixture, or 4% Briggs' salt mixture and 2% NBC vitamin fortification mixture. The USP salt mixture XIV contains five times the amount of iron present in the Briggs' salt mixture, while the NBC vitamin fortification mixture contains 45 times more menaquinone (vitamin K_3) than the Weglicki vitamin mixture. Among rats maintained on the vitamin E-deficient diet for six weeks, only those that received the combination of salt mixture USP XIV and the Weglicki vitamin fortification mixture showed a significantly lower level of hepatic catalase activity compared with the corresponding control animals. Hepatic microsomes from rats fed the experimental diets for six weeks showed no significant differences in P-450 and b_5 cytochrome levels. After 12 wk on the vitamin E-deficient diet, a significant depression in these cytochromes was noted in all experimental groups except that given the salt mixture USP XIV and NBC vitamin fortification mixture. At the end of 12 wk, hepatic catalase activity was significantly higher in rats maintained on the latter diet than in those given the salt mixture USP XIV and the Weglicki vitamin mixture. Since the most striking differences in the diets studied are in their content of iron and menaquinone, it appears that these two dietary constituents may interact in modulating the effect of vitamin E on hepatic hemeproteins.

8263 INVESTIGATIONS ON THE PATHOGENESIS OF LOCAL IRRADIATION-INDUCED LIVER FUNCTION DISORDERS. *(Ger.)* Svesnikov, A. A.; Gileva, T. P.; Bandurko, L. N. (Acad. Med. Sci., Obninsk, USSR). *Radiobiol. Radiother. (Berl.)* 15(6):731-740, 1974.

Histological changes in the liver were compared with liver function tests (serum protein fractions, serum BSP retention, biliary excretion of sodium benzoate, and serum bilirubin levels) performed on male and female rabbits following irradiation of: (1) the surgically exposed liver (3000, 6000, and 12,000 rad); (2) the surgically exposed stomach (1000, 1200, and 1600 rad); or (3) a 6 x 10 cm field, 6 cm below the xiphoid process which did not include either the stomach or liver. Studies were performed three and seven days after irradiation and weekly thereafter until the results of liver function tests normalized. The source of γ-radiation was ^{60}Co, and controls were nonirradiated animals subjected to the same surgical procedures as groups 1 and 2. In group 1, irradiation suppressed connective tissue proliferation around foci of necrosis in the hepatic parenchyma. BSP retention was increased, the extent of the increase being dose-dependent. Exposure to 12,000 rad increased BSP maximum retention to almost 13 times the control value. After 21 days, the 6,000- and 12,000-rad doses had increased serum bilirubin levels two- to four-fold; these doses also reduced total serum protein levels and changed the serum protein pattern. A dose-dependent decrease in biliary excretion of sodium benzoate followed irradiation with all doses. Irradiation of the exposed stomach had less effect on the results of liver function tests which normalized sooner than those done when the exposed liver was irradiated. Morphological changes in the liver consisted of granular dystrophy and the lysis of small groups of hepatocytes around the central vein; moderate interlobular connective tissue proliferation was also observed after irradiation with 1600 rad. All rabbits in group 3 exposed to 2500 or 3200 rad died 15 to 28 days after irradiation. At doses of 2500 and 3200 rad, BSP retention and serum bilirubin values increased, serum protein concentrations changed, and biliary excretion of sodium benzoate decreased significantly. Exposure to all three doses produced edema and proliferation of interstitial connective tissue followed by proliferation

of connective tissue around interlobular blood vessels and, in some cases, granular hepatocytic dystrophy and lysis of small groups of hepatocytes in the central zones of the lobules. Some rabbits had small, focalized hematomas in these areas. The extent of these changes were dose-dependent. These findings, and results from previous investigations, suggest that intra-abdominal irradiation of the hepatic region produces latent liver damage due to the indirect effect on other irradiated organs.

8264 THE COMBINED USE OF ORAL CHOLECYSTOPAQUE MEDIA AND IODIPAMIDE. *(E.)* Goergen, T.; Goldberger, L. E.; Berk, R. N. (Univ. California-San Diego Sch. Medicine, La Jolla, Calif.). *Radiology* 111(3):543-546, 1974.

Studies were performed to measure concentrations of iodipamide and total iodine excreted in bile after p.o. cholecystography with iopanoic acid and ipodate and i.v. cholangiography. Five fasting adult dogs were used. Total bile flow was collected *via* catheters every 15 min by gravity. Iodipamide concentration in bile was determined using a well-type gamma counter. When dogs were given a combination of iopanoic acid and iodipamide by infusion, the biliary excretion of iodipamide decreased by 90% after eight hr of infusion. In dogs given iodipamide alone or those given iopanoic acid p.o. followed 14 hr later with iodipamide, there was no significant difference in mean iodipamide excretion. Total biliary iodine concentration was identical to iodipamide iodine when 1.0 or 3.0 g of ipodate was instilled into the duodenum 30 min prior to infusion of iodipamide (0.3 ml/kg). The larger dose produced a significant decrease in the concentration of iodipamide from 8 mg/kg to 6 mg/kg. Similar results were obtained with a 0.6 ml/kg dose of iodipamide. When 1.0 or 3.0 g of ipodate was given in combination with 0.3 or 0.6 ml/kg of iodipamide, the total bile iodine concentrations increased from 15 mg/ml with iodipamide alone to 18 mg/ml in combination. When 1.0 g of ipodate was given with 0.6 ml/kg of iodipamide, the total iodine concentration in bile equaled control values. Ipodate and iodipamide compete for excretion on a dose-related basis, but any diminution of iodipamide concentration is compensated by the presence of ipodate or iopanoic acid in the bile. Biliary contrast materials can be used in sequence without risk of impaired visualization in the i.v. cholangiogram. A risk of nephrotoxicity can be expected if it is assumed that the diminished iodipamide excretion in bile results in increased urinary excretion of the contrast agent.

8265 INTRAVENOUS CHOLANGIOGRAPHY IN DIFFERENT DEGREES OF COMMON BILE DUCT OBSTRUCTION: AN EXPERIMENTAL STUDY IN THE DOG. *(E.)* Burgener, F. A.; Fischer, H. W.; Adams, J. T. (Univ. Medicine and Dentistry, Rochester, N.Y.). *Invest. Radiol.* 10(4):342-350, 1975.

The most effective dose and rate of administration of contrast agent in i.v. cholangiography were studied in three male mongrel dogs equipped with Thomas cannulas through which complete and incomplete common bile duct obstruction were produced by means of a Foley catheter. ^{125}I-labeled iodipamide (0.3, 0.6, 1.2 or 1.8 ml/kg) was infused into a vein in the foreleg or neck of the fasted dogs over a period of 0.5, 2, or 6 hr. ^{125}I was estimated in samples of serum, bile, and urine collected at intervals throughout and/or at the end of the infusion. With incomplete common bile duct obstruction, the iodine concentration in the bile necessary for radiographic visualization of the common duct was obtained with iodipamide in dosages of 0.3 to 1.2 ml/kg infused over a 30 min period. The largest dose resulted in the highest concentrations of label in the bile. With complete common bile duct obstruction the iodine concentration with all three dose levels was far below that necessary to visualize the duct radiographically. The total amount of iodipamide excreted in the bile increased with increasing contrast material dosage and decreased with increasing obstruction, while the hepatic efficiency for iodipamide excretion decreased with increasing dose and increasing bile duct obstruction. With incomplete obstruction, the iodipamide serum clearance curves did not differ significantly with different dose levels; the slope was more gentle with complete obstruction. The iodipamide serum half times increased with increasing obstruction. With complete common bile duct obstruction, increasing the infusion time had no significant effect on the biliary iodine concentrations. The overall highest biliary iodipamide concentration was found with a dosage of 1.8 ml/kg infused in 30 min. Since even the highest biliary concentration was insufficient to visualize the completely obstructed duct, it is suggested that the currently used dosages of 0.3 and 0.6 ml/kg not be exceeded because of the inherent risk of toxic side effects.

8266 CROSS-DIALYSIS IN THE TREATMENT OF EXPERIMENTAL FULMINANT HEPATIC COMA. *(E.)* Santiago-Delpin, E. A.; Callender, C.; Kjellstrand, C. M.; Buselmeier, T. J.; Najarian, J. S. (Dept. Surgery, Univ. Minnesota, Minneapolis, Minn.). *J. Surg. Res.* 19(3):175-182, 1975.

The potential value of cross-dialysis in the treatment of fulminant hepatic failure was tested in mongrel dogs with massive ischemic necrosis, which was induced by side-to-side portacaval shunt and ligation of the portal triad and of the gastrohepatic ligament. The dogs were then cross-dialyzed against normal healthy dogs in a two-chamber Kiil-type dialyzer containing membranes of different pore size and chemical composition. Four dogs were dialyzed across Union Carbide membranes, three across Amicon PM 30 membranes, and three across cuprophane membranes. Three additional dogs were cross-perfused. Coma developed seven to ten hr after the surgical procedure and untreated controls died two to five hr after onset of coma. Improvement occurred in all cross-perfusion experiments and survival was prolonged to 34.6 hr. Awakening and improvement of coma occurred in seven of the ten dialyzed dogs, with ambulation in three of seven. Two of these animals had been dialyzed with Union Carbide membranes. Survival, however, was prolonged

(20, 21, and 24 hr) in only three animals. In both the cross-perfusion and cross-dialysis experiments, blood pH and oxygen partial pressure were not altered until the end of the experiment. Hypoglycemia was not seen and hemolysis was slight. LDH, SGOT, and SGPT values rose in cross-perfused dogs, whereas in dialyzed dogs SGOT and SGPT levels, as well as creatinine phosphokinase and alkaline phosphatase values, were lower in recipient dogs than in donors. Autopsy showed blood ascites in eight of ten dialyzed animals, with a fluid hematocrit of 4 to 16%. Postmortem findings in perfused dogs were mild bloody ascites, lung congestion, pleural effusions, and essentially dead livers. The results indicate that cross-dialysis is feasible in the management of experimentally induced hepatic coma and liver necrosis, with minimal complications of volume and hemolysis.

8267 STUDIES ON THE OXYGEN SUPPLY OF HETEROTOPIC AUXILIARY LIVER GRAFTS IN RATS. *(E.)* Thermann, M.; Zelder, O.; Hess, F.; Jostarndt, L.; Jerusalem, C. R.; Hamelmann, H. (Chirugische Universitatsklinik, Robert-Koch-Strasse 8, D-355 Marburg/Lahn, West Germany). *Eur. Surg. Res.* 7(3):156-163, 1975.

Heterotopic auxiliary liver transplantation was performed in Wistar rats by a modification of the method of Hess *et al.*, and the effects of the procedure on the oxygen supply of the graft were determined by local oxygen partial pressure (PO_2) measurements made with a multiwire Pt-surface electrode. Only two of the seven lobes of the rat liver (=30% of the parenchyma) were used as a graft. In six animals, the PO_2 of graft tissue was determined as follows: after opening of the abdomen; two to three min after ligation of the hepatic artery; after completing preparation of the donor and host; during extracorporeal hemoglobin-free perfusion; and three to six min after revascularization and application of 3 ml of plasma substitute. In seven sham-operated animals, liver tissue PO_2 was measured as follows: after opening the abdomen; two to three min after ligation of the hepatic artery; before ligation of 70% of the parenchyma; and after ligation of five lobes and the application of plasma substitute. Graft liver tissue PO_2 decreased drastically after ligation of the hepatic artery and remained low during the preparation period. During the extracorporeal perfusion phase the graft was anoxic. After revascularization and application of the plasma substitute, the PO_2 of liver parenchyma increased to preoperative values although the graft was supplied with portal blood only. In the sham-operated animals, liver tissue PO_2 remained low before ligation and increased after ligation and application of the plasma substitute. This increase was also seen in the absence of a plasma substitute, indicating that increased tissue PO_2 cannot be accounted for by the hemodilution effect alone. The dominant cause of the increased PO_2 after revascularization may be the increased portal perfusion rate; the whole amount of portal blood supplies only 30% of the liver parenchyma. The PO_2 of the graft parenchyma was low in the first month post-transplantation but increased continually in the following months, reaching normal values after one yr.

8268 INFLUENCE OF A CHRONIC ADMINISTRATION OF DIETHYLNITROSAMINE ON THE RELATION BETWEEN SPECIFIC TISSULAR AND DIVISION FUNCTIONS IN THE RAT LIVER. *(E.)* Van Cantfort, J.; Barbason, H. (Service de Chimie médicale, Université de Liège, 151, Bd. de la Constitution, 4000 Liège, Belgium). *Eur. J. Cancer* 11(8):531-536, 1975.

Previous studies in hepatectomized adult rats demonstrated a mutually exclusive relation between the division function of liver and the specific tissular function, monitored by the measurement of cholesterol-7α-hydroxylase activity. In the present study, the evolution of these functions was followed during hepatic carcinogenesis induced in male Sprague-Dawley rats by chronic diethylnitrosamine (DEN) treatment (40 µl/l of drinking water for 100 days). The mitotic index was higher (1%) in DEN-treated animals than in controls, but the normal circadian rhythm of mitoses was not detected. DEN treatment for 25 days partially abolished the circadian rhythm of cholesterol-7α-hydroxylase; treatment for 55 days totally abolished the rhythm. Enzyme activity was significantly lower than normal. Of the two drug-metabolizing enzymes studied, the activity of benzopyrene hydroxylase was almost completely inhibited after 55 days of DEN treatment and that of aminopyrine-N-demethylase was decreased by about 55%. Animals given DEN for 25 days after partial hepatectomy showed no reduction in cholesterol-7α-hydroxylase activity, but the first mitotic wave was inhibited relative to that in operated controls. Partial hepatectomy performed after 25 days of DEN treatment caused no reduction in cholesterol-7α-hydroxylase activity but abolished the nycthermeral rhythm of the enzyme. When partial hepatectomy was performed after 55 days of DEN treatment, animals showed a transient (24 hr) decrease in cholesterol-7α-hydroxylase activity and no nycthemeral rhythm of mitoses. In hepatectomized animals, DEN treatment further inhibited the activities of the drug-metabolizing enzymes. These results suggest that the process of cellular transformation during DEN-induced carcinogenesis involves a derangement in the simultaneous regulation of specific tissular and division functions. In unoperated as well as in partially hepatectomized animals, these two functions lose their normal mutually exclusive regulation and their specific nycthemeral rhythms.

8269 EFFECT OF TOTAL HEPATECTOMY ON SELECTED CEREBRAL SUBSTRATES AND ENZYMES OF THE GLYCOLYTIC PATHWAYS AND KREBS CYCLE. *(E.)* Zieve, L.; Nicoloff, D.; Doizaki, W. (Veterans Admin. Hosp., Minneapolis, Minn. 55417). *Surgery* 78(4):414-423, 1975.

The effect of hepatectomy on the brain content of selected substrates (6 from glycolytic pathway and 5 from Krebs cycle) and enzymes (4 and 5, resp.)

involved in glucose metabolism was studied in 16 dogs. Brain biopsies were taken from three dogs two hr postoperatively and from 13 dogs sustained on glucose until lapsing into coma (20-30 hr post-hepatectomy). Three sets of controls were used: 12 dogs sedated at biopsy, four dogs sedated for at least 24 hr, and four sedated dogs in hypovolemic shock. Brain tissue extracts were analyzed for the substrates: glucose, G-6-P, dihydroxyacetone phosphate, phosphoenolpyruvate, pyruvate, lactate, ammonia, glutamine, citrate and alpha-ketoglutarate. Enzymes analyzed included: glucokinase, phosphofructokinase, pyruvate kinase, isocitrate dehydrogenase, glutamate dehydrogenase, malate dehydrogenase and malic enzyme. With the exception of lactate, ammonia, and glutamine, all of the substrate measurements were made either by direct fluorometric technique or by indirect ketone method. Enzyme activity and lactate concentration were measured spectrophotometrically while ammonia and glutamine were determined by a microdiffusion technique. There were no significant differences in brain glycolytic substrate concentrations between dogs lapsed into posthepatectomy coma and the normal or sedated dogs. Dogs in shock showed increased levels of brain pyruvate, lactate, moderate increases in citrate and alpha-ketoglutarate, and decreases in fumarate and malate. There was no significant alteration in brain enzyme activity after hepatectomy. However, dogs in shock showed increased glucokinase and decreased glutamine dehydrogenase activity. Cerebral ATP concentration was unchanged, but ammonia and glutamine concentrations were increased threefold. It was concluded that hepatectomy had no unique effect on the brain content of glycolytic pathway or Krebs cycle substrates and enzymes, nor on the brain content of ATP.

8270 AN IMPROVED SYSTEM FOR HEMOGLOBIN-FREE PERFUSION OF ISOLATED RAT LIVERS. *(E.)* Schmucker, D. L.; Jones, A. L.; Michielsen, C. E. (San Francisco Veterans Admin. Hosp., San Francisco, Calif. 94121). *Lab. Invest.* 33(2):168-175, 1975.

A newly designed perfusion system which permits the use of hemoglobin-free perfusates at near physiologic flow rates in isolated male Sprague-Dawley rat livers is presented. The preservation of hepatic fine structure, O_2 consumption, bile secretion rate, and the retention of intracellular potassium ions were evaluated. The perfusion apparatus was composed of two identical systems each consisting of an atraumatic pulsatile pump, a hyperbaric silastic tubing oxygenator, an organ bypass manometer, a perfusate reservoir and a gas humidifier. The livers were perfused through the portal vein alone, 20 to 25 ml of perfusion medium/min at 38 C for 2 to 5 hr. The medium contained neither RBC nor O_2 carriers. The use of hyperbaric oxygenation eliminated the hemoglobin requirement of the perfusion medium. Extensive endothelial cell injury associated with the use of hemoglobin-free media was avoided since this system permits perfusion at near physiologic hepatic portal vein flow rates. In addition, hepatic fine structure was preserved for more than four hr. The quality of isolated livers perfused without albumin in the medium suggests that an oncotic agent is not required for rat liver perfusion.

8271 ALTERATIONS IN PHARMACOKINETICS OF DRUGS IN PORTACAVAL SHUNT. *(Ger.)* Gugler, R.; Lain, P.; Azarnoff, D. L. (Med. Clin., Univ. Bonn, Germany). *Z. Gastroenterol.* 13(3):393-397, 1975.

Plasma concentrations of lidocaine and antipyrine were determined by gas chromatography 10 to 300 min after administration of these drugs to dogs before and 8 to 14 days after creation of end-to-side portacaval shunts. Lidocaine was administered in doses of 10 and 30 mg/kg, p.o., and 10 mg/kg, i.v., before surgery, and in 10 mg/kg doses i.v. and p.o. after surgery. Antipyrine was administered in a dose of 20 mg/kg, p.o. and i.v., before and after surgery. When plasma concentrations of lidocaine were plotted against time, the area under the curve of the p.o. administered drug was only 15% of the area under the curve for the i.v. dose. After surgery, the area under the curve for the oral dose was more than 80% of that under the curve for the comparable i.v. dose. The half-life increased significantly from 74 to 88 min and plasma clearance values decreased even more markedly. The area under the curve for 30 mg/kg lidocaine, p.o., was three times the area under the curve for the 10 mg/kg, p.o. dose, indicating that this drug is taken up by the liver in a dose-dependent manner. No significant differences were found in the plasma levels of antipyrine before and after shunt surgery. The half-life and plasma clearance values were identical, and no differences were found in the imaginary distribution volumes.

8272 THE EFFECT OF PORTACAVAL TRANSPOSITION ON HEPATIC CYTOCHROME P-450 IN THE RAT. *(E.)* Pector, J. C.; Ossenberg, F. W.; Peignoux, M.; Benhamou, J. P. (Hopital Beaujon, 100 boulevard du General Leclerc, 92110 Clichy, France). *Biomedicine* 23(5):160-162, 1975.

The effects of portacaval anastomosis (performed on 30 rats) and portacaval transposition (performed on 15 rats) on colloidal radiogold fractional clearance and on the hepatic cytochrome P-450 level were compared in adult male Charles River rats. The animals were subjected to one of these two surgical procedures or were sham-operated by laparotomy and mobilization (performed on 30 rats) and, in some cases, left nephrectomy (performed on 15 rats). On the fifteenth postoperative day, colloidal radiogold ^{198}Au (5 μCi) was injected i.v. into anesthetized rats. Blood samples were taken from the carotid artery one, two, three and four min later and colloidal fractional radiogold clearance was calculated. Immediately thereafter, the animals were sacrificed and the livers were assayed for cytochrome P-450. Colloidal radiogold fractional clearance was significantly lower in the rats with portacaval anastomosis (0.556/min) than in their sham-operated controls (0.842/min), but was not significantly different in the animals with porta-

caval transposition (0.808/min) and in their sham-operated controls (0.798/min). Liver weight and hepatic cytochrome P-450 concentrations were also significantly lower in the rats with portacaval anastomosis (0.60 nM/mg of microsomal protein) and with portacaval transposition (0.55 nM/mg) than in the controls (0.83 nM/mg and 0.76 nM/mg, resp.). These data support the hypothesis that the decrease in hepatic cytochrome P-450 results from the deprivation of one or more substances normally supplied by portal blood that contribute to maintenance of the cytochrome level. The decreased clearance of colloidal ^{198}Au in the rats with portacaval anastomosis appeared to be due to a reduction in the liver blood flow; liver blood flow was normal in the animals with portacaval transposition.

8273 QUANTIFICATION OF THE CAPACITY OF THE LIVER TO REMOVE AMMONIA FROM THE CIRCULATION OF DOGS WITH PORTACAVAL TRANSPOSITION. *(E.)* Aldrete, J. S. (Dept. Surgery, Univ. Alabama, Birmingham, Ala.). *Surg. Gynecol. Obstet.* 141(3):399-404, 1975.

Ten dogs with portacaval transposition were studied to quantitate the ammonia that the liver removes from circulation and to investigate the distribution of this substance before and after an exogenous ammonia load. The animals were studied by placing catheters: (1) in the hepatic and portal veins through the external jugular vein, (2) in the portal vein, and (3) in the infrarenal vena cava through the femoral vein. A catheter was also placed in the femoral artery. Blood ammonia levels in each catheter were measured before and at 15-min intervals during continuous infusion of ammonium sulfate (0.7 mg/kg for 45 min) through the infrarenal vena cava. In five of the ten dogs, the total hepatic blood flow was estimated by using a continuous infusion of indocyanine green and Fick's formula. Hepatic extraction rates of ammonia were calculated by relating blood ammonia levels in the inflow and outflow tracts of the liver to the estimated hepatic blood flow. The latter changed minimally before and after portacaval transposition. Prior to infusion, blood ammonia levels were 30 µg/100 ml of blood in hepatic veins; 100 µg/100 ml in the femoral artery and the inferior vena cava; and 200 µg/100 ml in the portal vein. The segment of portal vein anastomosed to the suprarenal infrarenal vena cava contained an average of 78 µg/100 ml more of ammonia than the infrarenal vena cava. During the 45-min infusion period, the blood ammonia levels increased by at least 90% at all sites, except in the hepatic veins, where they remained below 55 µg/100 ml. When the infusion was discontinued, the levels decreased rapidly but remained 30 to 60% higher than the preinfusion levels for at least 45 min. The liver was found to remove 80-97% of the ammonia reaching it by means of the urea cycle; the remaining ammonia is apparently passed again into the central venous circulation. It gradually accumulates throughout the vascular system as documented by the persistently elevated blood ammonia levels measured after discontinuing the ammonia load.

8274 EARLY RECOVERY OF ALBUMIN SYNTHESIS AFTER LIVER TRANSPLANTATION. *(E.)* DeRiberolles, C.; Franco, D.; Lecompte, Y.; Blondeau, B.; Chauvaud, S.; Grange, D.; Bismuth, H. (Hôpital Paul-Brousse, Villejuif, France). *Eur. Surg. Res.* 7(3):164-169, 1975.

The length of time required for transplanted livers to become functional was studied in 20 mongrel dogs of both sexes. Bromsulphalein (BSP) plasma disappearance rate after a single injection of BSP (2.5 mg/kg) and albumin synthesis after a single i.v. injection of methionine ^{35}S were studied in normal dogs, animals which had undergone total hepatectomy 2 hr previously, and animals which had received orthotopic liver grafts 2 hr previously. BSP clearance in the transplanted dogs (0.086) was significantly lower than in the normal controls (0.247), but was significantly higher than in the hepatectomized dogs (0.030). The plasma clearance of newly synthesized albumin was similar in the transplanted and normal dogs 30, 45, and 60 min after injection of the precursor. In contrast, plasma radioactivity was significantly lower in the hepatectomized animals. The data indicate that transplanted livers recover synthesizing function soon after transplantation and that such livers would be able to support life and correct the disturbances created by liver failure and surgery after only a brief delay. The results further suggest that in the early postoperative period BSP clearance is not an accurate assessment of hepatic function.

8275 THE SOURCE OF ASCITIC FLUID IN EXPERIMENTAL CIRRHOSIS IN THE RAT. *(E.)* Mazzacca, G.; Bianco, A. R.; Budillon, G.; Perillo, N. (Second Sch. Medicine, Univ. Naples, Naples, Italy). *Pathol. Microbiol. (Basel)* 42(1):66-69, 1975.

To disclose the source of ascitic fluid in liver cirrhosis, normal and cirrhotic (induced by CCl_4 and phenobarbitone treatment) male Wistar rats were injected with fluorescein (0.5 ml of a 5% solution infused into the paracecal vein) under anesthesia. The serosal and hepatic gut surfaces, which had been exposed prior to the fluorescein treatment, were scanned for 30 min under UV light. After scanning, the livers were removed, sliced, and stained with hematoxylin-eosin. After 12 wk of combined CCl_4-phenobarbitone treatment, the livers of 19 of the 26 surviving animals showed histologic evidence of portal cirrhosis. Although the hepatic and other peritoneal surfaces in the cirrhotic rats appeared to be wetter on laparotomy than those of the controls, and small amounts of free fluid were observed in six cirrhotic rats, abundant ascites was not detected. In the normal rats and noncirrhotic treated rats, small areas of very slight green fluorescence appeared on the surface of the liver one to two min after fluorescein injection; no fluorescence was detected on any extrahepatic area. In the cirrhotic rats without ascites, slightly more intense fluorescence appeared on the liver surface one to two min after fluorescein treatment. In comparison with the other animals, the rate of peritoneal transudation

was enhanced in the rats with ascites; in addition, significant transudations were observed in areas other than the hepatic surface. The results indicate that both the liver and visceral peritoneum are sources of ascites in cirrhosis; the liver is also an important source of ascitic fluid in the normal state.

8276 PEROXISOME DEPLETION IN RAT LIVER DURING PNEUMOCOCCAL SEPSIS. *(E.)* Canonico, P. G.; White, J. D.; Powanda, M. C. (U.S. Army Medical Res. Inst. of Infectious Diseases, Frederick, Md. 21701). *Lab. Invest.* 33(2):147-150, 1975.

The effects of pneumococcal sepsis on the number of hepatic peroxisomes and the activity of catalase and urate oxidase were studied in male Fisher-Dunning rats. The animals were inoculated s.c. with 10^6 *Diplococcus pneumoniae*, serotype I organisms. Liver homogenates were prepared at selected intervals following inoculation. The distribution of enzymatic activity was studied after isopycnic zonal centrifugation. Peroxisomal and endoplasmic reticular contents of liver parenchymal cells were analyzed by electron microscopic morphometry. Infected rats became febrile by 18 hr postchallenge and bacteremic by 24 hr; death usually occurred after 52 to 56 hr. Peroxisomal enzymatic activities decreased significantly 24 hr postinoculation. The value of catalase and urate oxidase fell to 16% and 28%, resp., of the control values by 48 hr. Infection did not alter the intracellular distribution of these enzymes. The activities of several liver mitochondrial, cytoplasmic, and lysosomal enzymes were unchanged during bacterial sepsis. Analysis of the peroxisomal content of the liver parenchymal cells confirmed a substantial decrease (from 52.9 x 10^9 peroxisomes/cm^3 for the controls to 25.4 x $10^9/cm^3$ in experimental livers) in peroxisome-like organelles by 24 hr postinfection. It is suggested that during some bacterial infections, the hepatic synthesis of acute-phase serum proteins occurs at the expense of peroxisomal protein synthesis, resulting in a reduction in the peroxisomal protein pool and in the number of peroxisomes.

8277 IMMUNOPATHOLOGY OF MOUSE HEPATITIS VIRUS TYPE 3 INFECTION. III. CLINICAL AND VIROLOGIC OBSERVATION OF A PERSISTENT VIRAL INFECTION. *(E.)* Le Prevost, C.; Virelizier, J. L.; Dupuy, J. M. (INSERM U 56, Hopital d'Enfants, F 94270 Bicetre, France). *J. Immunol.* 115(3):640-643, 1975.

The clinical and virologic observations in mice developing chronic disease following infection with mouse hepatitis virus type 3 (MHV3) are reported. The clinical evolution in C3H mice infected with MHV3 was age-dependent. Mice of six weeks or less were highly susceptible and died within a week, maximal resistance was observed in 10 to 15-week-old animals, and mortality increased to about 50% after six months of age. Three weeks after infection, both the male and female surviving mice developed a chronic disease characterized by a wasting syndrome and later by uncoordination, progressive paralysis, and death. When a variety of other strains were tested, the CBA, AKR, I, (A/J x DBA/2)F_1, and (A/J x C57BL/6)F_1 hybrids showed the same pattern of viral sensitivity as the C3H strain. In contrast, strain A/J animals were resistant at both six and 12 weeks of age while strains BALB/c, NZB, B10.D2-old, C57BL/6, and DBA/2 were susceptible at both six and 12 weeks of age. Among the semisusceptible strains, such as C3H, paralysis occurred in most of the surviving animals. Twenty-six and 42 days post-infection, virus was recovered from the liver, brain, spleen, and lymph nodes of a large number of paralyzed C3H mice. The viral infection was persistent despite consistently low virus titers. The titers of viral suspensions prepared from the liver or serum of six-month-old mice four days after MHV3 infection were intermediate between those observed in DBA/2 mice and those observed in paralyzed C3H animals. The clinical evolution in six-month-old C3H mice injected with MHV3 was correlated with the titer of virus tested four days after infection. It is suggested that in chronically infected mice, the reticuloendothelial system harboring the virus might undergo passive damage leading to immunologic disturbances and to irreversible destruction of the nervous tissue.

8278 BILE ACIDS INHIBIT LYSOZYME ACTIVITY [abstract]. *(E.)* Ghoos, Y.; Vantrappen, G.; Peters, T. (Dept. Med. Res., Univ. Leuven, Leuven, Belgium). *Gut* 16(5):394, 1975.

8279 ENTRY OF ^{14}C-ERYTHRITOL AND ^{3}H-MANNITOL INTO PANCREATIC AND BILIARY SECRETIONS AND THE EFFECT OF SECRETIN IN THE RAT [abstract]. *(E.)* Smith, N. (Dept. Med., Univ. Chicago, Chicago, Ill.). *Gastroenterology* 68(4):1092, 1975.

8280 BILE ACID BIOSYNTHESIS: THE METABOLISM OF 7α-HYDROXY-4-CHOLESTEN-3-ONE IN THE BILE FISTULA RAT [abstract]. *(E.)* Sherman, C. A. (Univ. Minnesota Hosp., Minneapolis, Minn.). *Gastroenterology* 68(4):1092, 1975.

8281 BILE SALTS ARE NOT NECESSARY FOR STEROL MICELLIZATION [abstract]. *(E.)* Cooperstein, L. A.; Little, J. M.; Dowd, S. R.; Lester, R.; Carey, M. C. (Dept. Med., Univ. Pittsburgh, Pittsburgh, Pa.). *Gastroenterology* 68(4):1089, 1975.

8282 PROCOLLAGEN BIOSYNTHESIS BY FIBROTIC RAT LIVER SLICES [abstract]. *(E.)* Rojkind, M. (Centro de Investigacion del IPN, Apartado Postal 14-740, Mexico 14, D. F.). *Gastroenterology* 68(4):1083, 1975.

8283 AN IN VITRO APPROACH TO ALCOHOLIC LIVER DISEASE: INHIBITION OF TISSUE CULTURE CELL GROWTH BY LOW CONCENTRATIONS OF ETHANOL [abstract]. *(E.)* Miller, Jr., J. V. (Univ. New Mexico Sch. Med., Albuquerque, New Mexico). *Gastroenterology* 68(4):1081, 1975.

8284 THE PROCESS OF CHOLESTEROL CHOLELITHIASIS INDUCED BY DIET IN THE PRAIRIE DOG: A PHYSICOCHEMICAL CHARACTERIZATION [abstract]. *(E.)* Holzbach, R. T.; Corbusier, C.; Marsh, M.; Naito, H. K. (Cleveland Clin. Found., Cleveland, Ohio). *Gastroenterology* 68(4):1077, 1975.

8285 STUDY OF THE STIMULATION OF THE BILE SALT NON-DEPENDENT FRACTION OF CANALICULAR BILE WATER (BSNDF) BY PHENOBARBITAL [abstract]. *(E.)* Gumucio, J. J.; Balabaud, C.; Gray, R. H.; Kline, A. J. (Sch. Public Health, Univ. Michigan, Ann Arbor, Mich.). *Gastroenterology* 68(4):1077, 1975.

8286 BRAIN ENERGY METABOLISM IN ACUTE HEPATIC COMA [abstract]. *(E.)* Biebuyck, J. E.; Funovics, J. M.; Dedrick, D. F.; Fischer, J. E. (Harvard Med. Sch., Boston, Mass.). *Gastroenterology* 68(4):1073, 1975.

8287 HEPATIC CHOLESTEROL (CH) ESTERIFICATION: A POSSIBLE DETERMINANT OF HEPATIC CH EXCRETION [abstract]. *(E.)* Davis, R. A.; Lutz, W. T.; Kern, Jr., F. (Univ. Colorado Sch. Med., Denver, Colo.). *Gastroenterology* 68(4):1072, 1975.

8288 ALKALINE PHOSPHATASE IN LYMPH AND SERUM AFTER BILE DUCT LIGATION [abstract]. *(E.)* Hauser, S.; Baker, A. (Dept. Med., Univ. Chicago, Chicago, Ill.). *Gastroenterology* 68(4):1068, 1975.

8289 INCREASED SULFATION AND DECREASED 7α-HYDROXYLATION OF DEOXYCHOLIC ACID (DCA) IN ETHINYL ESTRADIOL (EE) INDUCED CHOLESTASIS IN RATS [abstract]. *(E.)* Jensen, R.; Davis, R.; Kern, Jr., F. (Univ. Colorado Med. Cent., Denver, Colo.). *Gastroenterology* 68(4):919, 1975.

8290 ACTIVATION OF CYCLIC-AMP STIMULATED PROTEIN KINASE IN THE PERFUSED RAT LIVER. RELATION TO GLUCONEOGENESIS [abstract]. *(E.)* Friedmann, N. (Univ. Texas Med. Sch., Houston, Texas). *Gastroenterology* 68(4):895, 1975.

8291 VITAMIN B_{12} ANALOG PRODUCTION IN THE EXPERIMENTAL BLIND LOOP [abstract]. *(E.)* Brandt, L. J.; Bernstein, L. H.; Efron, G.; Wagle, A. (Montefiore Hosp., Bronx, N. Y.). *Gastroenterology* 68(4):863, 1975.

8292 RECEPTOR MECHANISMS INVOLVED IN HISTAMINE STIMULATED BILE FLOW [abstract]. *(E.)* Kaminski, D. L.; Ruwart, M. J.; Jellinek, M. (St. Louis Univ., St. Louis, Mo.). *Gastroenterology* 68(4):921, 1975.

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8350 EFFECT OF FASTING, URIDINE-DIPHOSPHATE-GLUCOSE (UDPG), AND PHENOBARBITAL (PB), ON HEPATIC AND EXTRAHEPATIC GLUCURONYL TRANSFERASE (GT) ACTIVITY IN SPRAGUE-DAWLEY RATS [abstract]. *(E.)* Scremin, S.; Asquini, A.; Okolicsanyi, L. (Istituto di Patologia Medica dell' Universita, Padova, Italy). *Rend. Gastroenterol.* 6(3):219, 1974.

8351 THE EFFECTS OF CHOLECYSTECTOMY ON THE BILE SALT POOL OF THE SYRIAN HAMSTER. *(E.)* Beher, W. T.; Lin, G. J.; Konde, W. N.; Stradnieks, S. (Henry Ford Hosp., Detroit, Mich.) *Fed. Proc.* 34(3):661, 1975.

8352 HYDROXYLATION OF BILE ACID PRECURSORS BY RABBIT MICROSOMES. *(E.)* Elliott, W. H.; Ali, S. S. (St. Louis Univ. Sch. Med., St. Louis, Mo.). *Fed. Proc.* 34(3):660, 1975.

See also, 8044, 8202, 9029, 9071, 9072, 9171, 9317, 9387.

SECRETION AND METABOLISM

Intestine

8353 CONTROL OF DEOXYRIBONUCLEIC ACID SYNTHESIS IN NORMAL RABBIT COLONIC MUCOSA. *(E.)* Alpers, D. H.; Philpott, G. W. (Washington Univ. Sch. Medicine, 660 South Euclid Ave., St. Louis, Mo. 63110). *Gastroenterology* 69(4):951-959, 1975.

The influence of modifiers of cyclic AMP (cAMP) levels on DNA synthesis in white New Zealand rabbit colonic mucosa was studied in short-term organ culture. Midsigmoid colon sections were cultured. Base line studies showed that the incorporation of

[^{3}H]thymidine into DNA was linear for 24 hr and occurred mainly in mucosal cells, as demonstrated by autoradiography. Right colon explants consistently had less DNA synthetic activity per mg of total protein than left colon explants. A gradient in the amount of DNA synthesis was observed; it was lowest in the cecum and increased to a maximum (3-fold greater) at the splenic flexure. The pattern was eliminated by a 48 hr fast, at which time no formed stool remained in the colon. Intracellular cAMP modifiers depressed colonic DNA synthesis. Theophylline added to explants inhibited DNA synthesis by 35% at 0.5 mM and increased intracellular cAMP levels (at 5 mM theophylline, cAMP was increased from 19.4 ± 4.8 pM/mg to 40.6 ± 2.5 pM/mg of protein). The inhibition was not observed until ten hr after theophylline addition and was partly reversible. N^6,O^2-dibutyl cAMP inhibited DNA synthesis at 0.025 mM. Adenosine and sodium butyrate were ineffective up to 1.0 mM concentrations. 5'-AMP did not inhibit DNA synthesis, but elevated intracellular cAMP levels at concentrations less than 0.1 mM. Other ineffective cAMP modifiers were prostaglandins E_1, E_2, $F_{2\alpha}$ (2 x 10^{-6} M), and papaverine (1 μM). Thymidine uptake was unaffected by these drugs. The intrinsic thymidine pool, estimated at 20 μM by isotope dilution, was not altered by theophylline. It is concluded that DNA synthesis in rabbit colon can be suppressed by increased cAMP levels within a short-term organ culture. The drugs which elevated cAMP levels did not suppress DNA synthesis by decreasing intracellular thymidine concentrations.

8354 UPTAKE, ACTIVATION, AND ESTERIFICATION OF FATTY ACIDS IN THE SMALL INTESTINE OF THE SUCKLING RAT. *(E.)* Holtzapple, P. G.; Smith, G.; Koldovsky, O. (Univ. Pennsylvania Sch. Medicine, Philadelphia, Pa.). *Pediatr. Res.* 9(10):786-791, 1975.

Microsomal preparations of jejunum and ileum from fetal, one-day, three-day, five-day, and 10-day-old Charles River rats were studied for the activity of oleoyl-CoA synthetase and acyl-CoA:monoglyceride acyltransferase, and jejunal slices from 6 or 11-day-old and adult rats were studied for uptake and esterification of oleic acid. The jejunal activity of microsomal oleoyl-CoA synthetase fell from a fetal value of 240 nM product/mg protein/min to 40 on day one, then leveled by day three to 160, which was not significantly different from adult values, while that of acyl-CoA:monoglyceride acyltransferase increased from a fetal value of 40 nM product/mg protein/min to 210 at 12 days, then fell to adult values of 120. Ileal activity of oleoyl-CoA synthetase remained low into adult life, while that of acyl-CoA:monoglyceride acyltransferase peaked at 180 nM product/mg protein/min on day 12, then gradually fell to adult levels. The rate of oleic acid uptake was faster in jejunal slices from six-day-old rats (2000 mM oleic acid/g wet tissue/15 min at 0 C) than those from adult rats (500 nM/g/15 min at 0 C). Likewise, esterification occurred at faster rates in six-day-old rats (1000 nM oleic acid converted to triglyceride/g wet tissue/5 min at 37 C) than in adults (400 nM/g/5 min at 37 C), so that the ratio of the two (uptake/conversion) remained constant. This indicates that the availability of free fatty acid is one factor responsible for the increased rate of esterification at this age.

8355 LACTATE FORMATION BY RAT SMALL INTESTINE IN VITRO. *(E.)* Leese, H. J.; Bronk, J. R. (Dept. Biology, Univ. York, York YO1 5DD, U.K.). *Biochim. Biophys. Acta* 404(1):40-48, 1975.

The formation of lactic acid by mucosal slices, jejunal rings and strips of the underlying smooth muscle of the rat jejunum was studied. Specimens were incubated in a modified Krebs-Ringer bicarbonate solution for short periods (8 min or less). Samples of the incubation medium were taken at intervals for the determination of lactate by the automated fluorometric method. When mucosal slices were incubated in the absence of glucose or when K^+ completely replaced Na^+ in the medium, there was a rapid initial release of lactate followed by a slow rise in the lactate content of the medium. Approximately twice as much lactate was liberated in the Na^+ medium as in the K^+ medium. The addition of glucose (11.1 mM) after a 30-sec preincubation initiated a short period of rapid lactate release into the normal Na^+-containing medium (lasting about 30 sec) that was followed by a steady rise in the lactate concentration, greater in magnitude (24 μM/g dry weight) than in the corresponding period in the absence of glucose (7.0 μM/g dry weight). In the high K^+ medium, over four times as much lactate was formed in the presence of glucose (9.7 μM/g dry weight) than in its absence (2.3 μM/g dry weight), but less than was produced in the Na^+ medium. The time course of lactate release suggested a negative Pasteur effect of mucosal slices, which was not reversed by the addition of ADP (1 mM) or glucose-6-phosphate (11.1 mM). By contrast, the rate of lactate formation by rings and muscle from rat jejunum increased steadily over the incubation period (more pronounced in the rings than in the muscle), indicating a positive Pasteur effect. The values for tissue lactate content indicated that about three-quarters of the lactate released into the medium during the first 30 sec was present in the tissue initially. These results illustrate the danger of assuming from *in vitro* studies that the capacity of the intestine to produce a particular metabolite is the sum of the capacities of its individual parts. The time course of lactate formation by jejunal rings could not be predicted from the data obtained with mucosal and muscle layers separately.

8356 EFFECT OF DIOCTYL SODIUM SULFOSUCCINATE ON COLONIC FLUID AND ELECTROLYTE MOVEMENT. *(E.)* Donowitz, M.; Binder, H. J. (Dept. Internal Medicine, Yale Univ., New Haven, Conn. 06510). *Gastroenterology* 69(4):941-950, 1975.

The effect of dioctyl sodium sulfosuccinate (DSS) on intestinal fluid and electrolyte movement was studied *in vivo* in fasted (18 hr) male Sprague-Dawley rats and *in vitro* with rat colonic mucosa

in a modified Ussing chamber. *In vivo*, DSS induced secretion of water and sodium, increased HCO_3 secretion, and decreased chloride absorption in the rat cecum. The secretory phenomenon was dose-related: 1 mM DSS had no effect while maximal effect was observed at 4 mM. The secretion was rapidly reversible; normal absorptive rates were present in the three-hr period immediately following replacement of DSS with isotonic saline solution. *In vitro*, 0.5 mM of DSS induced a prompt increase in both short circuit current and potential difference and diminished sodium absorption. The increase in short circuit current was not observed when HCO_3 or chloride were absent from the incubation solution or when theophylline was present. In addition, it was found that DSS also significantly increased mucosal cyclic AMP levels. These results support the hypothesis that DSS stimulates fluid and electrolyte secretion, which is mediated by increased mucosal cyclic adenosine 3':5' monophosphate.

8357 EFFECT OF DIET ON ENZYMES OF THE BRUSH BORDER OF THE SMALL INTESTINE AND KIDNEY OF RATS. *(E.)* Saito, M.; Suda, M. (Sch. Medicine, Ehime Univ., Matsuyama, Ehime, Japan). *J. Nutr. Sci. Vitaminol.* 21(3):207-215, 1975.

The effects of dietary casein and starch on the peptide-hydrolyzing enzymes of the small intestinal brush border were studied in male Wistar rats. The animals were maintained for five days on diets containing 5 to 91 g casein/100 g diet and 0 to 71 g starch/100 g diet. They were then killed and the small intestinal mucosa was homogenized and assayed for protein, leucineaminopeptidase, maltase, and glucose. Diets with low starch and high casein contents resulted in higher specific leucineaminopeptidase activities in the small intestine than did diets with high starch and low casein content. Diets high in starch and low in casein increased the specific activity of maltase, however. Rat small intestine contains at least two isoenzymes of leucineaminopeptidase: one bound to the brush border and the other not bound to it but recoverable in the soluble fraction. Only the former was influenced by the diets fed. The maximum velocity of leucineaminopeptidase bound to the brush border during DEAE-cellulose column chromatography was twice as high in the rats on high casein diets as in those on low casein diets, but the Michaelis constant was approximately the same in both groups. The leucineaminopeptidase and maltase activities in the kidney were not influenced by diet. The results suggest that the mechanisms of regulation of maltase and leucineaminopeptidase are different, and that the metabolic regulation of the epithelial cells in the kidney is quite different from that of the cells in the small intestine.

8358 THE EFFECTS OF PHYTATE ON INTESTINAL ABSORPTION AND SECRETION OF ZINC, AND WHOLE-BODY RETENTION OF Zn, COPPER, IRON AND MANGANESE IN RATS. *(E.)* Davies, N. T.; Nightingale, R. (Rowett Res. Inst., Bucksburn, Aberdeen AB2 9SB, Scotland). *Br. J. Nutr.* 34(2):243-258, 1975.

Groups of male Hooded Lister rats (Rowett Institute strain) were fed regular diets supplemented with 15 mg/kg Zn, 15 mg/kg Zn + 10 g/kg phytate, 0.5 mg/kg Zn, or 0.5 mg/kg Zn + 10 g/kg phytate for 21 days to study the effect of phytate on Zn utilization. Isolated loops of duodenum injected with 5.07 µM phytic acid were subsequently injected with 0.2 ml saline containing 5 µg Zn (0.1 µCi ^{65}Zn) to study the effect of phytate on reabsorption of endogenously secreted Zn. From the fourth day phytate-fed rats showed a marked reduction in weight gain (cumulative weight gain at 21 days: 140 g, control; 30 g, phytate-fed). Of those fed 15 mg/kg Zn diets, phytate-fed rats and pair-fed control rats had calculated mean Zn absorption values of 25.3 and 53.2 µg Zn absorbed/day, resp. On 0.5 mg/kg Zn, there was a net loss of Zn with values of 0.87 and 7.6 µg Zn loss/day for control and phytate-fed rats, resp. In ligated duodenal loops, phytate reduced the binding and absorption of Zn so that the total mucosal uptake of Zn was 0.76 µg Zn/loop/15 min in phytate-injected loops. These results support previous findings that phytate reduces Zn utilization. It is suggested that since more than 80% luminal Zn in phytate-injected loops was in suspended particulate form, Zn is unavailable for absorption due to co-precipitation with Ca and phytate.

8359 INTERACTION OF CHOLERA TOXIN AND MEMBRANE G_{M1} GANGLIOSIDE OF SMALL INTESTINE. *(E.)* Holmgren, J.; Lonnroth, I.; Mansson, J. E.; Svennerholm, L. (Inst. Medical Microbiology, Univ. Goteborg, Goteborg, Sweden). *Proc. Natl. Acad. Sci. USA* 72(7): 2520-2524, 1975.

The binding properties of *Vibrio cholerae* toxin to intestinal mucosa cells and the relation of these properties to the mucosal content of galactosyl-*N*-acetylgalactosaminyl-(sialyl)-galactosylglucosylceramide (G_{M1}) ganglioside were studied. Ganglioside G_{M1} was isolated from human, porcine, and bovine small intestinal mucosa in amounts corresponding to 0.1, 2.0, and 43 nM/g fresh weight, resp. These differences in G_{M1} content were associated with a quantitatively different ability of mucosal cells to bind cholera toxin. When saturated with 50 U/ml toxin, human cells bound 15,000 toxin molecules/cell, the porcine cells--120,000 molecules/cell, and the bovine cells--2,600,000 molecules/cell. For cells of all three species, the association constant (K_A) of the cholera toxin binding was about 10^9 liters/M. Exogenously added G_{M1} ganglioside was incorporated in intestinal mucosal cells as well as in intact rabbit small intestine. Incubation of intestinal cells with G_{M1} ganglioside (0.07-2 µM) did not alter K_A values but resulted in a concentration-dependent increase in the number of receptors for toxin on human and porcine mucosal cells, and in segments of rabbit small intestine; the effect was much less on the G_{M1}-rich bovine cells. G_{M1} incorporation increased the sensitivity of the rabbit small intestine to the diarrheogenic action of 0.1 and 1.0 mg cholera toxin. *V. cholerae* sialidase (10 U/ml) hydrolyzed isolated intestinal di- and trisialogangliosides to G_{M1}. However, the enzyme did not change the ganglioside pattern of

intestinal mucosa, had very little influence on the number of toxin binding sites on intestinal cells, and did not alter the sensitivity of the small intestine to the diarrheogenic action of the toxin. These results demonstrate a relation in the intestinal mucosa between the G_{M1} ganglioside concentration, the number of binding sites for cholera toxin, and the sensitivity to the biologic action of the toxin. These data strongly support the concept that the G_{M1} ganglioside is the intestinal binding receptor for cholera toxin.

8360 STUDIES ON THE PEYER'S PATCHES OF GERM-FREE AND CONVENTIONAL MICE IMMUNOGLOBULIN BY SYNTHESIS IN VITRO [abstract]. *(E.)* McClelland, D. B. L. (Univ. Hosp., Leiden, The Netherlands). *Gut* 16(5):402, 1975.

8361 RELEASE OF SECRETIN FROM S CELLS OF PORCINE DUODENUM AND JEJUNUM BY ACID [abstract]. *(E.)* Joffe, S. N.; Bloom, S. R.; Polak, J. M.; Welbourn, R. B. (R. Postgrad. Med. Sch., London, England). *Gut* 16(5):398, 1975.

8362 SELECTIVE INHIBITION OF BICARBONATE SECRETION IN THE PERFUSED RAT COLON DURING HEMORRHAGIC SHOCK [abstract]. *(E.)* Noel, D.; Sicotte, C. (Centre Hospitalier Universitaire, Sherbrooke, Quebec, Canada). *Gastroenterology* 68(4):1090, 1975.

8363 EFFECT OF CHOLERA TOXIN (C.T.) ON RABBIT JEJUNAL GLYCOLYTIC (GLY) AND GLUCONEOGENETIC ENZYMES [abstract]. *(E.)* Sherr, H. P.; Stifel, F. B.; Herman, R. H. (Army Res. Nutr. Lab., Denver, Colo.). *Gastroenterology* 68(4):984, 1975.

8364 CYTOCHROME P-450 IN DUODENAL MUCOSA: DEPENDENCE ON DIETARY (LUMINAL) IRON [abstract]. *(E.)* Hoensch, H. P.; Woo, C. H.; Schmid, R. (Dept. Med., Univ. California, San Francisco). *Gastroenterology* 68(4):912, 1975.

8365 CHARACTERISTICS OF RELEASE OF DUODENAL GASTRIN [abstract]. *(E.)* Wesdorp, R. I. C.; Funovics, J. M.; Hirsch, H.; Fischer, J. E. (Harvard Med. Sch., Boston, Mass.). *Gastroenterology* 68(4):892, 1975.

8366 MECHANISM OF BILE ACID DIARRHEA: THE ROLE OF CYCLIC AMP IN COLONIC SECRETION [abstract]. *(E.)* Conley, D. R.; Coyne, M. J.; Chung, A.; Bonorris, G. G.; Schoenfield, L. J. (Cedars-Sinai Med. Cent., Los Angeles, Calif.). *Gastroenterology* 68(4):877, 1975.

8367 EFFECT OF PLANT LECTINS ON THE BINDING OF HUMAN INTRINSIC FACTOR-VITAMIN B_{12} COMPLEX (IF-B_{12}) TO ISOLATED GUINEA PIG BRUSH BORDER MEMBRANES (BBM) [abstract]. *(E.)* Boedeker, E. C.; Boldt, D. H. (Walter Reed Inst. Res., Washington, D. C.). *Gastroenterology* 68(4):866, 1975.

8368 BIOSYNTHESIS OF LIPOPROTEINS BY INTESTINAL EPITHELIUM, SITE OF SYNTHESIS AND SEQUENCE OF ASSOCIATION OF LIPID, SUGAR AND PROTEIN MOIETIES [abstract]. *(E.)* Kessler, J. I.; Narcessian, P.; Mauldin, D. P. (R. Victoria Hosp., Montreal, Canada). *Gastroenterology* 68(4):1058, 1975.

8369 THE DIFFERING EFFECTS OF PROTEASES IN ENZYMES OF HUMAN INTESTINAL MICROVILLUS MEMBRANE [abstract]. *(E.)* Seetharam, B.; Goodwin, D.; Grimme, N.; Alpers, D. H. (Washington Univ. Sch. Med., St. Louis, Mo.). *Gastroenterology* 68(4):1053, 1975.

8370 EFFECT OF LARGE DOSES OF VITAMIN B_{12} ON INTESTINAL MICROFLORA. *(Rus.)* Villako, K. P.; Tamm, A. O. (Dept. Propedeutic Internal Diseases, Tartu Univ., Tartu, USSR). *Ter. Arkh.* 47(2): 118-121, 1975.

8371 STRUCTURAL REQUIREMENTS FOR THE INTERACTION OF THE HORMONALLY ACTIVE FORM OF VITAMIN D, 1α, 25-$(OH)_2$-D_3, WITH ITS INTESTINAL RECEPTOR SYSTEM. *(E.)* Procsal, D.; Norman, A. W. (Dept. Biochem., Univ. California, Riverside, Calif.). *Fed. Proc.* 34(3):894, 1975.

8372 THE FATE OF ACID IN THE RABBIT'S JEJUNUM [abstract]. *(E.)* Chung, R. S. K.; Johnson, G.; DenBesten, L. (Univ. Iowa Coll. Med., Iowa City, Iowa). *Clin. Res.* 23(3):247A, 1975.

8373 THE INFLUENCE OF CHOLINOCEPTOR ACTIVITY ON THE MITOTIC RATE IN THE CRYPTS OF LIEBERKUHN IN RAT JEJUNUM. *(E.)* Tutton, P. J. M. (Dept. Anatomy, Monash Univ., Clayton, Victoria, Australia). *Clin. Exp. Pharmacol. Physiol.* 2(3):269-276, 1975.

8374 METABOLISM OF NUCLEIC ACIDS IN CELLS OF INTERNAL ORGANS OF ANIMALS WITH INTESTINAL HIGH FISTULAE. *(Rus.)* Chkheidze, R. D. (Tiflis State Inst. Med., USSR). *Soobshch. Akad. Nauk Gruz. SSR).* 77(2):477-480, 1975.

8375 ENZYME ACTIVITY OF THE RAT'S SMALL INTESTINAL MUCOSA DURING REPEATED EXPOSURE TO HIGH AMBIENT TEMPERATURES. *(Rus.)* Rakhimov, K.; Demidova, A. I. (Dept. Physiology, Uzbek Acad. Science, Tashkent, USSR). *Fiziol. Zh.* 61(5):778-784, 1975.

8376 STUDIES ON HYDROLYSIS OF PHOSPHOLIPIDS IN RAT SMALL INTESTINAL SMOOTH MUSCLE. *(Jpn.)* Kudoh, N. (Dept. Surgery Section I, Sapporo Medical Coll., Sapporo, Japan). *Sapporo Igaku Zasshi* 43(2): 121-133, 1974.

8377 ENZYMO-SECRETORY MUCOSAL FUNCTION OF THE SMALL INTESTINE IN EXPERIMENTAL ACUTE PANCREATITIS. *(Rus.)* Redchits, P. S. (Dept. Surgery, Odessa Inst. Lab. Biochemistry, USSR). *Patol. Fiziol. Eksp. Ter.* 616(2):74-75, 1975.

8378 HISTOENZYMATIC INVESTIGATIONS ON THE ADAPTATION PROCESS OF VILLI IN THE REMAINING SEGMENT OF SMALL INTESTINE AFTER EXTENSIVE RESECTION OF THIS INTESTINE. *(Pol.)* Gawronski, M.; Mastynska, M.; Dworak, Z.; Kadlubowska, M.; Stajgis, P. (Dept. of Pathological Anatomy, Inst. of Biostructure of the Medical Acad., Poznan, Poland). *Pol. Przegl. Chir.* 47(5):605-611, 1975.

8379 ELABORATION OF MODELS OF EXPERIMENTAL ULCERATIVE AFFECTION [SIC] OF THE LARGE INTESTINE. *(Rus.)* Abdullaev, N. K.; Latipov, A.; Sysoeva, S. A. (Lab. Pathophyiology, Scientific Res. Inst. Rural Medicine Ministry Public Health Uzbek SSR, Tashkent, USSR). *Patol. Fiziol. Eksp. Ter.* 616(2):81-84, 1975.

See also, 8030, 8038, 8040, 8043, 8129, 8131, 8168, 8278.

GENERAL

8380 COMPARISON OF GASTRIC MUCOSAL BLOOD FLOW AS DETERMINED BY AMINOPYRINE CLEARANCE AND γ-LABELED MICROSPHERES. *(E.)* Archibald, L. H.; Moody, F. G.; Simons, M. A. (Univ. Utah Sch. Medicine, Salt Lake City, Utah 84132). *Gastroenterology* 69(3):630-634, 1975.

The gastric mucosal blood flow of anesthetized dogs prepared with a chambered segment of the stomach greater curvature was measured simultaneously by aminopyrine clearance and γ-labeled microspheres (15 ± 5 μ). In 11 dogs paired flow measurements were made of secretion in response to i.v. histamine (1 μg/kg/min). Similar measurements were made in 11 nonsecreting dogs given i.v. isoproterenol (0.5 or 1.0 μg/kg/min) and in nine dogs given no drugs to stimulate secretion of blood flow. Various combinations of isoproterenol and histamine were given in eight injections to additional dogs. During all experiments isotonic HCl was maintained on the mucosal surface. A highly significant linear correlation between clearance and microsphere-measured flow in histamine and isoproterenol experiments was demonstrated by regression analysis. Clearance averaged 83% of microsphere flow during histamine stimulation but only 25% during isoproterenol stimulation. The relation between clearance and microsphere flow was not significantly different for resting and isoproterenol experiments. Measured by microspheres, the mucosal perfusion was about five times the resting value for both histamine and isoproterenol-stimulated dogs. Perfusion calculated from aminopyrine clearance averaged 46, 38, and 90% of the microsphere value in the resting, isoproterenol, and histamine experiments, resp. A constant ratio of microsphere-measured flow to clearance (1.25) existed regardless of the secretory rate. The results indicate that aminopyrine clearance reflects only a small fraction of mucosal blood flow in the nonsecreting stomach, even in the presence of exogenous acid.

8381 SYNAPTIC POTENTIALS RECORDED FROM NEURONES OF THE SUBMUCOUS PLEXUS OF GUINEA-PIG SMALL INTESTINE. *(E.)* Hirst, G. D. S.; McKirdy, H. C. (Dept. Physiology, Monash Univ., Clayton, Victoria, Australia). *J. Physiol. (Lond.)* 249(2): 369-385, 1975.

Submucous neurons (211) prepared from middle portions of guinea pig small intestine and 23 other submucous neurons that had been extrinsically denervated 10 to 15 days earlier were studied to examine excitatory synaptic potentials (esp) and inhibitory synaptic potentials (isp) in guinea pig submucous plexuses. Single transmural stimuli initiated esp in all neurons studied. Recruitment of esp occurred as stimulator voltage increased from 11 to 37 V. In 89 of 211 neurons, a single stimulus initiated a 1 to 5 sec hyperpolarization in addition to the esp. With the addition of 10^{-4} g/ml of tubocurarine, the esp was blocked and the isp could be examined. By passing inward current through the recording electrode, the polarity of isp could be reversed (equilibrium potential required was 20-40 mV more negative than resting potential). Removal of K^+ from the bath increased the isp amplitude (amplitude initiated by paired stimuli was 16-43 mV). Nine of 23 extrinsically denervated submucous neurons demonstrated isp. Atropine (10^{-6} g/ml) and biculline (10^{-6} g/ml) had no effect on isp. Guanethidine (10^{-5} g/ml) and 2-bromo-d-lysergic acid (10^{-6} g/ml) abolished isp without having any effect on esp. It is suggested that most submucosal plexus neurons receive extensive excitatory input and many receive inhibitory input. The esp is probably mediated by acetylcholine and isp may be mediated by adrenergic substances released by intrinsic nerves.

8382 NEURAL CONTROL OF GASTRIC MUCOSAL BLOOD FLOW IN THE RAT. *(E.)* Guth, P. H.; Smith, E. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gastroenterology* 69(4):935-940, 1975.

The mechanisms by which sympathetic nerve stimulation reduces gastric mucosal blood flow and parasympathetic nerve stimulation increases it were studied in fasted male Wistar rats. An *in vivo* microscopy technique was used in sodium pentobarbital-anesthetized rats to directly visualize the gastric microcirculation during

left splanchnic nerve and vagal nerve stimulation. A Narco square-wave stimulator with silver electrodes was used for nerve stimulation, and during vagal nerve stimulation, the submucosa was continuously superfused with norepinephrine (0.04-0.4 µg/min). The average control diameter of the submucosal arterioles was 21.6 µm. Stimulation of the left splanchnic nerve (8 volts, 2 to 5 millisec impulses, 10 impulses/sec) for 3 min caused an initial vasoconstriction (maximum 69.2% of control values) followed by partial escape (mean 89.8% of control values) in all animals. The mean time from onset of stimulation to maximum vasoconstriction and to maximum escape was 37.3 and 87.4 sec, resp. No arteriovenous anastomoses were seen either in the resting state or during nerve stimulation. Mucosal studies with splanchnic stimulation revealed an initial progressive slowing of flow in the capillaries, followed by partial escape. There were no significant differences between the times to maximum initial circulatory change in the submucosa and mucosa, or between the times to maximum escape in the submucosa and mucosa. In 45 of 51 episodes of vagal nerve stimulation (8 volts, 2 millisec impulses, 6 impulses/sec) in 11 rats, the submucosal arterioles dilated within 10 sec of the beginning of stimulation, and in 45 of 51 episodes, the arterioles decreased in diameter within 10 sec of the cessation of stimulation. These changes were highly significant. The average dilation was 10.8% above the diameter during norepinephrine superfusion alone. The results indicate that, in the rat, sympathetic stimulation decreases mucosal blood flow through a constricting effect on the supplying submucosal arterioles and not through the opening of "shunts." They also suggest a direct vasodilating effect of vagal stimulation on the gastric submucosal arterioles.

8383 DISTRIBUTION OF BLOOD FLOW IN THE INTESTINE WITH HYPERTONIC GLUCOSE IN THE LUMEN. *(E.)* Yu, Y. M.; Yu, L. C. C.; Chou, C. C. (Depts. Physiology and Medicine, Michigan State Univ., East Lansing, Mich.). *Surgery* 78(4):520-525, 1975.

Loops of jejunum exteriorized in mongrel dogs were divided into three segments and the effect of luminal placement of 50% glucose (D50) on blood flow distribution within the wall was studied using radioactive microspheres. Two series of experiments were performed: in series I, 10 dogs received 10 ml of polyethylene glycol (PEG) in one segment, 10 ml D50 in the second, and the third remained empty; in series II, eight dogs had one segment pretreated for 20 min with 10 ml of 0.4% dibucaine, then 10 ml of D50 injected into this and the second segment, and 10 ml PEG into the third. After 20 min for equilibration, ^{141}Ce and ^{85}Cr labeled microspheres (15 µ diameter) were injected into the left ventricle three min apart. Dogs were sacrificed a few minutes later, and the mucosa, submucosa, and muscle-serosa were separated. Mucosal blood flow was significantly increased in jejunal segments containing D50 (78.7% by ^{141}Ce and 80.3% by ^{85}Sr) as compared to the empty segment (70.1% by ^{141}Ce; 67.6% by ^{85}Sr) and PEG-containing segment (67.3% by ^{141}Ce; 67.6% by ^{85}Sr). Dibucaine pretreatment reduced the hyperemic effect of D50 (whole wall radioactivity: 10171 cpm with D50; 7105 cpm with D50 and dibucaine pretreatment), but flow remained elevated over controls (4301 cpm with PEG). This study indicates that the hyperemic effect of D50 is confined to the mucosal layer and suggests that this effect is due both to a direct effect of hypertonicity on the vasculature and an effect mediated by mucosal nerves.

8384 PHARMACOLOGIC EFFECTS OF GASTROINTESTINAL HORMONES ON INTESTINAL OXYGEN CONSUMPTION AND BLOOD FLOW. *(E.)* Bowen, J. C.; Pawlik, W.; Fang, W.; Jacobson, E. D. (Univ. Tex. Medical Sch. at Houston, Houston, Tex.). *Surgery* 78(4):515-519, 1975.

Side branches of the terminal trunks of the superior mesenteric artery were cannulated in 32 fasted mongrel dogs to study the effects on the mesenteric circulation of cholecystokinin-octapeptide (CCK), pentagastrin (PG), acetylcholine (Ach), glucagon, and synthetic secretin. Infusion of normal saline (0.2 ml/min) into the cannulated branch for 30 min served as a control; then CCK (0.1 µg/kg/min), PG (0.5 µg/kg/min), secretin (0.03 and 0.3 µg/kg/min), glucagon (0.5 µg/kg/min) or Ach (0.5 µg/kg/min) was infused at the same rate for 10 min. Blood flow increased 45% and O_2 consumption 23% within two min after CCK infusion began, and remained elevated throughout the 10-min period. Atropine (0.5 mg i.v.) reversed this effect. With infusion of PG, blood flow increased 60% in two min, but fell to 20% by eight min; there was a similar effect on O_2 consumption (35% at 2 min; 20% at 8 min). These effects were blocked by atropine. Ach increased flow by 55% and O_2 consumption by 35%, with both effects being reversed by atropine. Upon infusion of glucagon, blood flow increased 80% and O_2 consumption 40%, and these were unchanged by atropine. This suggests that CCK, glucagon, and PG (to a lesser extent) are mesenteric vasodilators and that the effects of CCK and PG appear to be mediated through cholinergic receptors.

8385 GLUCOCORTICOID AND MINERALOCORTICOID RECEPTORS IN GUT MUCOSA. *(E.)* Pressley, L.; Funder, J. W. (Monash Univ. Dept. Medicine, Prince Henry's Hosp., Melbourne, 3004, Australia). *Endocrinology* 97(3):588-596, 1975.

A basic receptor profile for glucocorticoids and mineralocorticoids along the mucosa of the gastrointestinal tract was established using adrenalectomized and oophorectomized adult female Agouti rats. Mucosal cells from the esophagus, antral stomach, duodenum, jejunum, ileum and colon were incubated for 15 to 240 min, at 4 or 25 C, in the presence of [^{3}H]aldosterone (2×10^{-9}M) or [^{3}H]dexamethasone (2.5×10^{-8} M), after which binding of the steroids in the cells was determined. At 4 C, the specific binding of [^{3}H]-dexamethasone was maximal at 60 min, falling to half maximal level by 180 min. At 25 C, maximal binding occurred at 15 min and began to fall after 45 min. Binding of the steroid was to sites with specificity characteristics appropriate for glucocorticoid receptors. The equilibrium dissociation constant, K_{diss} (defined as the concentration at which half

the binding sites are occupied), was 1.2 to 2.5 x 10^{-8} M. In the five gut tissues analyzed, dexamethasone appeared to occupy a single class of binding sites; the affinity of the receptors for dexamethasone varied from 1.0 x 10^{-8} for the ileum to 9 x 10^{-9} for the stomach and duodenum. The concentration of glucocorticoid receptors per unit of cytoplasmic protein decreased in the following order: duodenum > jejunum > ileum = stomach >colon. Their affinity for steroid hormones decreased in the following order: dexamethasone > corticosterone > deoxycorticosterone = aldosterone. No specific binding could be demonstrated in the esophageal mucosal cells. A demonstrable portion of the cytoplasmic binding of [^{3}H]aldosterone was to specific mineralocorticoid receptors. Binding sites for this steroid were demonstrated in the duodenum, jejunum, ileum and colon, but none were demonstrated in the antral mucosa. The demonstration of specific mineralocorticoid and glucocorticoid receptors in the gut mucosa serves as baseline data for any consideration of the physiology, pathophysiology or therapeutic use of adrenocorticoids in the gastrointestinal tract.

8386 SCANNING AND TRANSMISSION ELECTRON MICROSCOPY (SEM AND TEM) OF CULTURED ADULT RAT HEPATOCYTES [abstract]. *(E.)* Goldfarb, S.; Barber, T. A.; Pariza, M. W.; Becker, J. E.; Potter, V. R. (Univ. Wisconsin Med. Sch., Madison, Wis.). *Gastroenterology* 68(4):1076, 1975.

8387 USE OF NEUTRAL RED TO MEASURE GASTRIC MUCOSAL BLOOD FLOW [abstract]. *(E.)* Aures, D.; Guth, P. H.; Grossman, M. I. (VA Wadsworth Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):1057, 1975.

8388 THE EFFECT OF TRANSIT OF THE KIDNEY ON EXOGENOUS CCK [abstract]. *(E.)* Ramus, N. I.; Fender, H. R.; Rayford, P. L. (Univ. Texas Med. Branch, Galveston, Texas). *Gastroenterology* 68(4):970, 1975.

8389 GASTRODUODENAL BLOOD FLOW IN STRESS AND HYPOXIA: AN EXPERIMENTAL APPROACH [abstract]. *(E.)* Broadie, T. A.; Delaney, J. P. (Univ. Minnesota Health Sci. Cent., Minneapolis, Minn.). *Gastroenterology* 68(4):868, 1975.

8390 EFFECTS OF GASTROINTESTINAL HORMONES UPON INTESTINAL BLOOD FLOW AND OXYGEN CONSUMPTION [abstract]. *(E.)* Bowen, J. C.; Pawlik, W.; Fang, W. F.; Jacobson, E. D. (Univ. Texas Med. Sch., Houston, Texas). *Gastroenterology* 68(4):868, 1975.

8391 RELATIVE IMMUNOLOGIC AND BIOLOGIC POTENCIES OF SYNTHETIC ANALOGS AND FRAGMENTS OF CCK-OCTAPEPTIDE (CCK-OP) [abstract]. *(E.)* Go, V. L. W.; Reilly, W. M.; Ondetti, M. A.; Gardner, J. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 68(4):902, 1975.

8392 UNMYELINATED RECTAL AFFERENTS IN THE CAT VENTRAL ROOT [abstract]. *(E.)* Clifton, G. L.; Vance, W. H.; Coggeshall, R. E.; Willis, W. D. (Univ. Texas Med. Branch, Galveston, Texas). *Gastroenterology* 68(4):1088, 1975.

8393 IDENTIFICATION AND CHARACTERIZATION OF HUMAN ISOAMYLASES [abstract]. *(E.)* Gourgoutis, G. D. (Va Cent., Dayton, Ohio). *Gastroenterology* 68(4):903, 1975.

8394 THE EFFECT OF GASTROINTESTINAL HORMONES ON THE GASTRIC MICROCIRCULATION [abstract]. *(E.)* Guth, P. H.; Smith, E. (Wadsworth VA Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):907, 1975.

8395 DESTRUCTION OF LIPOPOLYSACCHARIDE COATED TARGET CELLS [abstract]. *(E.)* Kagnoff, M. F.; Campbell, S. M. (Univ. California, San Diego, La Jolla, Calif. 92037). *Gastroenterology* 68(4):920, 1975.

8396 CARRIER PRIMING OF T CELLS IN PEYER'S PATCHES BY ANTIGEN FEEDING [abstract]. *(E.)* Kagnoff, M. F. (Univ. California, San Diego, La Jolla, Calif. 92037). *Gastroenterology* 68(4):921, 1975.

8397 THE IMMUNOLOGICAL RESPONSE TO INTRAGASTRICALLY ADMINISTERED ALBUMIN AND VITAMIN A. EFFECT OF SPLENECTOMY [abstract]. *(E.)* Falchuk, K. R.; Perrotto, J. L. (Massachusetts Gen. Hosp., Boston, Mass.). *Gastroenterology* 68(4):891, 1975.

8398 THE USE OF PROSTAGLANDIN E_1 TO REVERSE EXPERIMENTALLY-INDUCED NONOCCLUSIVE INTESTINAL ISCHEMIA [abstract]. *(E.)* Davis, L. J.; Anderson, J. H.; Wallace, S.; Jacobson, E. D. (Univ. Texas System Cancer Cent. and Medical Sch., Houston, Texas). *Gastroenterology* 68(4):880, 1975.

8399 THE SYSTEMIC IMMUNE RESPONSE TO INTRAGASTRICALLY ADMINISTERED ALBUMIN: EFFECT OF VITAMIN A [abstract]. *(E.)* Falchuk, K. R.; Perotto, J. L.; Walker, W. A. (Massachusetts Gen. Hosp., Boston, Mass.). *Clin. Res.* 23(3):249A, 1975.

8400 EFFECT OF DIETARY LACTOSE AND CALCIUM ON BODY COMPOSITION IN THE GROWING RAT [abstract]. *(E.)* Romasz, R. S.; Evans, J. L. (Cook Coll., Rutgers Univ., New Brunswick, N. J.). *Fed. Proc.* 34(3):936, 1975.

8401 ORGAN SPECIFIC INTESTINAL ANTIGEN [abstract]. *(E.)* Rabin, B. S. (Univ. Pittsburgh, Pittsburgh, Pa.). *Fed. Proc.* 34(3):1018, 1975.

8402 RABBIT MODEL OF GELATINOUS DISEASE OF THE PERITONEUM ORIGINATING IN THE APPENDIX: STUDY OF GLYCOPROTEIN FRACTIONS IN THE EFFUSION. *(Fr.)* Ekindjian, O. G.; Levasseur, J. C.; Delavierre, J. P.; Jardillier, J. C.; Roux, M.; Agneray, J. (Laboratoire Biochimie, C.N.R.S., rue J.-B.-Clement, F 92290 Chatenay-Malabry, France). *Biol. Gastroenterol.* 8(2):99-106, 1975.

8403 VARIABILITY OF THE CELIAC TRUNK AND ITS ANASTOMOSES WITH THE SUPERIOR MESENTERIC ARTERY. *(Ger.)* Feigl, W.; Firbas, W.; Sinzinger, H.; Wicke, L. (Pathologisch-Anatomosches Institut, Universitat Wien, Spitalgasse, A.-1090 Wien, Austria). *Acta Anat.* 92(2):272-284, 1975.

8404 INTRAHEPATIC LYMPHOID TISSUE GRAFT: COURSE OF THE REACTION INDUCED BY PEYER'S PATCHES. *(E.)* Eloy, R.; Vaultier, J. P.; Vuitton, D.; Pousse, A.; Grenier, J. G. (INSERM, Chirurgic Expimentale Physiopathologic Digestive, Strasbourg, France). *Biomedicine* 23(4):139-143, 1975.

8405 THE GASTROINTESTINAL CIRCULATION. *(E.)* Grayson, J. (Univ. Toronto, Toronto, Canada). *Gastrointestinal Physiology*, Vol. 4, edited by E. D. Jacobson and L. L. Shanbour. Baltimore, Md., Univ. Park Press, 1974, pp. 105-138.

8406 STUDIES ON HEXOSAMINE-CONTAINING MACROMOLECULES IN THE WALL OF THE GASTROINTESTINAL TRACT OF THE RAT WITH ADDITIONAL OBSERVATIONS ON SOME PATHOLOGICAL SPECIMENS OF THE HUMAN STOMACH AND COLON. *(E.)* Terho, T. (Dept. Physiology, Univ. Turku, Turku, Finland). *Ann. Acad. Sci. Fenn. Ser. A2* 175:1-85, 1974.

8407 CHANGES IN THE COMPOSITION OF FREE AMINO ACIDS IN THE SERUM AND TISSUES IN EXPERIMENTAL INTESTINAL INFECTIONS WITH COLI BACTERIA. *(Rus.)* Niiazov, E. A.; Aripdzhanova, K. A. (Uzbek Research Inst. Pediatrics, USSR). *Med. Zh. Uzbek.* (10):66-69, 1974.

8408 BIOSYNTHESIS OF ESSENTIAL AMINO ACIDS IN MICROORGANISMS OF THE RUMEN. *(It.)* Viviani, R.; Scardovi, V.; Matteuzzi, D.; Frignani, M. (Facolta Agragria, Bologna, Italy). *Atti Accad. Sci. Inst. Bologna, Cl. Sci. Fis., Mem.* 262(5):1-25, 1974.

8409 COMPOSITION OF THE MICROFLORA IN THE DEVELOPMENT OF GASTROINTESTINAL SYNDROME IN IRRADIATED RATS. *(Fr.)* Desmettre, P. (Dept. de Protection, CEN de Fontenay-aux-Roses, France). *Bull. Inf. Sci. Tech., Commis. Energ. At. (Fr.)* (203):45-49, 1975.

8410 FOURTH SYMPOSIUM ON ORAL SENSATION AND PERCEPTION: DEVELOPMENT IN THE FETUS AND INFANT. *(E.)* Edited by J. F. Bosma. (Natl. Inst. Dental Res., N.I.H., Bethesda, Md.). Bethesda, Md., DHEW, 1973, 419 pp.

See also, 8018, 8359.

DIAGNOSTIC PROCEDURES

8411 THE ASSOCIATION OF CARCINOEMBRYONIC ANTIGEN AND PERIPHERAL LYMPHOCYTES. *(E.)* Papatestas, A. E.; Kim, U.; Genkins, G.; Kornfeld, P.; Horowitz, S. H.; Aufses, A. H., Jr. (Mount Sinai Hosp., 100th St. and Fifth Ave., New York, N. Y. 10029). *Surgery* 78(3):343-348, 1975.

The possible association between carcinoembryonic antigen (CEA), peripheral lymphocyte counts, and other cancer risk factors was studied in 97 patients with myasthenia gravis and 51 control patients with granulomatous disease of the bowel, ulcerative colitis, or colonic neoplasms. The available CEA assay results from 249 patients with myasthenia gravis were also evaluated in relation to the presence of thymomas, severity of the disease, and time interval following thymectomy, and peripheral lymphocyte counts were made in an additional 107 patients with granulomatous disease of the bowel. Among the myasthenia gravis patients in whom simultaneous determinations of CEA and peripheral lymphocytes were made, CEA was positive in 17% of those with lymphocyte counts above 2,000/mm^3 and in 43% of those with lower counts. The corresponding percentages in the control group were 20% and 61%. The difference in the percentage of positive CEA assays in relation to lymphocyte counts was highly significant in both groups. A significant difference between the mean lymphocyte values in groups with different CEA titers was also found. Study of 249 additional myasthenia gravis patients showed high CEA titers and low lymphocyte counts in those with thymomas and severe myasthenia gravis and decreased CEA titers with a corresponding increase in lymphocytes following thymectomy. A progressive decrease in the mean peripheral lymphocyte counts in relation to the duration of the disease was observed in 107 patients with granulomatous disease of the bowel. The data suggest that the CEA titer may be elevated in patients with low lymphocyte counts and both determinations may be used to determine the diagnosis and prognosis in patients with known neoplasms and in high cancer risk groups.

8412 THE BUTTERFAT ABSORPTION TEST IN ADULTS. *(E.)* Chaun, H.; Mullinger, M. A.; Solvonuk, P.; Ediss, I.; Bogoch, A. (Dept. Medicine, Univ. British Columbia, Vancouver, British Columbia V5Z 1K1, Canada). *Am. J. Dig. Dis.* 20(10):914-922, 1975.

The usefulness of the butterfat absorption test in assessing fat absorption was studied in adult patients with Crohn's disease (20), diarrhea (15), idiopathic ulcerative colitis (10), gluten-induced enteropathy (13), postgastrectomy and postvagotomy diarrhea (9), pancreatic disease (4), and miscellaneous gastrointestinal disorders (18). Following a six-day fat balance study, each patient was fasted (for a minimum of 8 hr) than given a 34% cream test meal (1 g butterfat/kg body weight). Venous blood samples were obtained at three and four hr after ingestion of this meal; determinations were made of serum turbidity and serum lipid electrophoresis. The lipid electrophoretic determinations were correlated with the optical density findings. Peroral jejunal mucosal biopsy specimens were also obtained for 65 patients. Of the 42 patients shown to have steatorrhea by the fat balance studies, 33 had abnormally low serum optical density values following butterfat ingestion. In eight of the 42 patients, steatorrhea could not be clearly explained on the basis of their underlying disease; 82.4% of the remaining patients with steatorrhea had an abnormal response following butterfat ingestion. The maximum rise in serum optical density following butterfat absorption was lowest in the patients with gluten-induced enteropathy and in those with Crohn's disease. The data indicate that a maximum increase in serum optical density of 0.25 or less is suggestive of steatorrhea in adult patients.

8413 LOW LACTASE LEVELS: EVALUATION OF THE RADIOLOGIC DIAGNOSIS. *(E.)* Morrison, W. J.; Christopher, N. L.; Bayless, T. M.; Dana, E. A. (Johns Hopkins Medical Institutions, Baltimore, Md. 21205). *Radiology* 111(3):513-518, 1974.

A study was conducted to determine the accuracy and specificity of the lactose-barium examination of the small bowel in the diagnosis of lactase deficiency in 36 subjects. Twenty-three of these had low-lactase levels, and 13 had normal lactase levels. The subjects with normal lactase level had a normal radiologic small bowel examination when 25 g of lactose was given with a barium sulfate suspension. Of 39 evaluations of the 13 normal subjects (by three observers), there was only one reading of a hydrophilic effect for an overall false-positive rate of 2.5%. The 23 low-lactase subjects, however, usually had an abnormal radiographic pattern. Of 69 evaluations, 88% showed a hydrophilic effect and were read as lactase-deficient (overall false-negative rate of 12%). Separate evaluations of a one-hr abdominal radiograph following administration of the lactose-barium meal showed a higher false-positive rate (10%) among lactase-normal subjects and an essentially unchanged false-negative rate (10%) among lactase-deficient individuals. Radiographic factors of most value in correctly assessing roentgenograms were rapid transit to the cecum and dilution of the contrast medium in the jejunum and ileum. About 20% of the low-lactase subjects exhibited evidence of small bowel hydrophilic effect upon evaluation of complete small bowel series and one-hr abdominal radiograph obtained with the barium meal without added lactose. Among the lactase-normal subjects, 7.5% of the examinations were read as positive on both the complete small bowel series and one-hr abdominal radiograph. Eighty percent of the low-lactase subjects had flat blood sugar level curves and 100% had flat curves or symptoms following an oral lactose tolerance test. Of the subjects with normal lactase levels, 8% had flat blood sugar curves and none had symptoms. The reliability of the lactose tolerance test when the blood sugar is used as the sole method of diagnosis is compromised by factors such as the rate of gastric emptying and diabetes. The one-hr lactose-barium examination is comparable to the lactose tolerance test and offers convenience and ease of performance with less discomfort to the patient. False-positives, occurring in patients with the irritable bowel syndrome, and a 5 to 15%

false-negative interpretation in low-lactase subjects both lessen the usefulness of a single one-hr roentgenogram as a screening procedure. However, this method is still comparable to the accuracy of blood sugar determinations in the lactose tolerance test.

8414 SERUM LIPASE ACTIVITY IN CHRONIC RENAL FAILURE. *(E.)* Sommer, H.; Kasper, H.; Fosel, T. (Medizinische Universitatsklinik, 87 Wurzburg, Josef-Schneider-Str. 2, Germany). *Acta Hepatogastroenterol. (Stuttg.)* 22(4):248-252, 1975.

The serum lipase activity of 110 patients (51 male, 59 female) with chronic renal failure and a glomerular filtration rate (GFR) of less than 80 ml/min was measured. The extent to which the frequency of hyperlipasemia and the degree of increased serum lipase activity corresponded to the cause and proportion of reduced renal function (and to hemodialysis therapy) was investigated. Chronic renal failure was also produced and studied in 15 male Wistar rats by 5/6-nephrectomy. Nine sham-operated rats served as controls. In 51 of 110 patients, lipase activity exceeded 200 IU (the upper limit of the normal value). The frequency of hyperlipasemia depended on the degree of reduction of renal function, the elevation of serum lipase activity and increased blood urea-N-concentration. In patients with a GRF less than 20 ml/min, the rate of hyperlipasemia was significantly higher in patients with chronic glomerulonephritis (75%) than among those with chronic pyelonephritis (46.8%). The frequency and degree of hyperlipasemia was not influenced by sex, age, or hemodialysis therapy. Significantly higher serum lipase activities were observed in nephrectomized rats (107.6 ± 72.7 IU) than in controls (41.8 ± 29.0 IU). These findings indicate that the degree of hyperlipasemia is influenced by the extent of chronic renal failure.

8415 PRELIMINARY APPRAISAL OF PRESENT ^{99m}Tc-PERTECHNETATE TECHNIQUES FOR DETECTING ECTOPIC GASTRIC MUCOSA. *(E.)* Marsden, D. S.; Priebe, C. J., Jr. (Roosevelt Hosp., 428 W. 59th St., New York, N. Y. 10019). *Radiology* 113(2):459-460, 1975.

In an effort to enhance the detectability of ectopic gastric mucosa using ^{99m}Tc, a model of a Meckel's diverticulum or intestinal duplication was developed in the dog. The effects of perchlorate and Histalog (betazole) on the detection of ectopic gastric mucosa were studied. Ectopic gastric mucosa was constructed by surgically implanting a full-thickness patch of stomach wall into a Roux-en-Y ileostomy while retaining its original bloood supply. Serial scintiphotographs were taken over a period of 180 min after ^{99m}Tc (1-10 mCi, i.v.) administration. Each study was repeated five times over a period of 12 months. Perchlorate (3 mg/kg) was given p.o. before the i.v. administration of ^{99m}Tc (14 mg/kg). In all cases, the ability of the stomach mucosa and the ectopic gastric mucosa to concentrate ^{99m}Tc was reduced, as compared to occasions when perchlorate was not administered. Perchlorate administration also increased the background radiation level of ^{99m}Tc in both the general circulation and in the bladder. Betazole (2 mg/kg, i.m.) did not enhance the ability of ectopic gastric mucosa to concentrate ^{99m}Tc in two dogs.

8416 COMPLICATIONS OF FIBEROPTIC ENDOSCOPY. I. ESOPHAGOSCOPY AND GASTROSCOPY. *(E.)* Meyers, M. A.; Ghahremani, G. G. (New York Hosp.-Cornell Univ. Medical Center, 525 E. 68th St., New York, N. Y. 10021). *Radiology* 115(2):293-300, 1975.

Flexible fiberoptic endoscopes are being used increasingly for direct visualization and biopsy of lesions in the upper gastrointestinal tract. Contrary to earlier expectations, the incidence of complications has not decreased despite the technical advantages of modern flexible instruments over semirigid endoscopes. The semiflexible lens-gastroscope has a perforation rate of 0.05 to 6% and an overall mortality of 0.004 to 0.014%, while fibergastroscopy carries a perforation rate of 0.074% and an overall mortality of 0.019%. Two patients with perforations of the cervical esophagus following fibergastroscopy are described. In the first patient, perforation of the cervical esophagus at the level of C8 was associated with loculation of a prominent abscess cavity extending below the level of the aortic arch into the retroesophageal mediastinal tissues. In the second patient, perforation of the cervical esophagus was accompanied by localized perforation and hematoma of the midthoracic esophagus. A third patient is presented in whom fiberesophagoscopy resulted in perforation of an ulcerated carcinoma in the midthoracic esophagus into the right pleural cavity, with pneumothorax and pleural effusion. This patient died following a complicated postoperative course. The first two patients responded to drainage with or without chest intubation. When cervical esophageal perforation occurs, lateral radiographs of the neck show evidence of air in the prevertebral space in virtually all cases. Esophagography with water-soluble contrast media may demonstrate the site of perforation in only 50%; this method is more valuable in perforations of the thoracic esophagus, showing extravasation at the site in 75 to 86%. Other possible complications of fiberoptic endoscopy cited in the literature are impaction of the fiberscope, gastric perforation, pseudo-acute abdomen, submandibular swelling, and aspiration pneumonia.

8417 COMPLICATIONS OF FIBEROPTIC ENDOSCOPY. II. COLONOSCOPY. *(E.)* Meyers, M. A.; Ghahremani, G. G. (New York Hosp.-Cornell Univ. Medical Center, 525 E. 68th St., New York, N. Y. 10021). *Radiology* 115(2):301-307, 1975.

Case reports are presented for eight patients who developed serious complications after undergoing fiberoptic endoscopy for endoscopic visualization and/or electrocautery removal of colonic polyps (6), evaluation of a submucosal lesion of the transverse colon (1), and evaluation of a filling defect in the hepatic flexure (1). Rectal perforation

occurred in two patients, sigmoid perforation in four, perforation of the transverse colon in one, and perforation of the hepatic flexure in one. Intraperitoneal rupture was immediately apparent in three cases but was initially overlooked in a 54-yr-old man with a free perforation resulting from coagulation necrosis of the colonic wall, and in a 68-yr-old man with perforation of the transverse colon into both the peritoneal cavity and the extraperitoneal tissues. Extraperitoneal perforation in the latter patient and in two other cases was masked for several hours or days. The majority of perforations developing in diagnostic colonoscopy occurred during mechanical manipulations, including slide-by, alpha maneuver, and straightening of the sigmoid loop. The demonstration of extraluminal gas documents perforation. Rectal perforation is indicated by gas ascending the posterior pararenal spaces bilaterally, with lucent areas paralleling the lateral borders of the psoas muscles. Extraperitoneal (posterior) perforation of the sigmoid, descending, or ascending colon results in a unilateral collection of gas within the anterior pararenal space, shown by a collection of mottled lucent areas with a generally vertical axis. Perforation of the sigmoid colon at a site between the leaves of the mesocolon may give rise to extraperitoneal gas, bilaterally, within the anterior paraspaces. Radiological localization of the precise site is important in locating a clinically uncertain site of perforation, indicating the proper treatment, and anticipating possible complications.

8418 INCREASED TRYPSIN CONCENTRATION IN THE DUODENAL JUICE FOLLOWING A TEST MEAL (LUNDH TEST) AND ITS POSSIBLE DIAGNOSTIC VALUE. *(Ger.)* Gyr, K.; Aenishanslin, H. W.; Kayasseh, L.; Stalder, G. A.; Agrawal, N. M.; Font, R. G. (Medizinische Universitatsklinik, Kantonsspital, CH-4004 Basel, Switzerland). *Dtsch. Med. Wochenschr.* 100 (26):1419-1422, 1975.

The Lundh test was used to study exocrine pancreatic function in 376 patients: 35 with chronic pancreatitis, 39 with acute pancreatitis, 247 suspected of having pancreatic disease, and 55 controls. The mean trypsin activity in the duodenal juice was above the upper normal limit in eight of these 376 patients, ranging from 29 to 37.1 IU/ml. Of these eight patients, two had manifest acute pancreatitis and the other six had undiagnosed epigastric and abdominal pain. In retrospect, clinical, laboratory, and radiological followups of these six patients suggest that five probably had pancreatic disease. The following retrospective diagnoses were established: acute pancreatitis (3 cases), pancreatitis and pancreatic pseudocyst (1 case), probably pancreatic disease in a patient who had peripancreatic calcifications at surgery, and functional symptoms (1 case). The percentage of patients with increased trypsin activity in the duodenal juice was significantly higher among patients with acute pancreatitis than among the control group. No correlation was found between the volume of duodenal juice and its mean trypsin activity. These findings and others reported in the literature suggest that increased trypsin activities in the duodenal juice in the Lundh test may be caused by subacute pancreatic disease and, in some cases, may be the only abnormal finding.

8419 USE OF SECRETIN IN HYPOTONIC DUODENOGRAPHY. *(E.)* Gutierrez, J. G.; Chey, W. Y.; Shah, A.; Holzwasser, G. (Isaac Gordon Cent. Gastroenterol., Rochester, N.Y.) *Radiology* 113(3):563-566, 1974.

The value of secretin (1 U/kg dissolved in 0.9% sodium chloride solution, i.v.) in the radiological study of the duodenal loop was studied in 8 healthy volunteers. Six subjects were fasted and a two-lumen tube assembly was passed orally with the proximal and distal openings in the second and third portions of the duodenum, resp. The motor activity of the duodenum was recorded before and for 30 min after a bolus injection of secretin. In a second study, 8 fasted volunteers were given secretin or the vehicle alone in a double-blind fashion. The duodenum was intubated with a Rehfuss tube and 1 oz of barium was delivered prior to drug injection; 2-3 min later, 2 oz of barium were delivered into the duodenum. One hr later, the procedure was repeated using the second drug (secretin or vehicle). Motility and tonicity were evaluated and side-effects were noted. The manometric studies showed complete inhibition of motor activity in the duodenum beginning 1-4 min after secretin administration and lasting 8-14 min. In half the subjects, there was a brief period of increased motor activity prior to the onset of duodenal paralysis; this activity occurred immediately after secretin administration and lasted 1.5 to 3.5 min. In the subjects in whom this increased activity was not noted, inhibition of motor activity occurred 1-2 min earlier. In the radiologic studies, there was no significant change in motility or tonicity after saline treatment, but both parameters were significantly decreased by secretin. Secretin produced hypotonic duodenograms of excellent quality in 6 cases, good quality in 1 case, and fair quality in 1 case. A mild headache was noted in one subject in the saline group and vague abdominal distress in one subject in the secretin group. It is concluded that secretin can be effectively used for hypotonic duodenography without producing undesirable side effects.

8420 A NEW TECHNIQUE OF ENDOSCOPIC ESOPHAGEAL BIOPSY USING MULTIPURPOSE BIOPSY TUBE IN THE DIAGNOSIS OF REFLUX ESOPHAGITIS. *(E.)* Mangla, J. C.; Kalra, T. M. (Monroe Community Hosp., 435 E. Henrietta Rd., Rochester, N. Y. 14603). *Am. J. Dig. Dis.* 20(8):775-780, 1975.

A new method of obtaining direct vision endoscopic, esophageal biopsies through a multipurpose biopsy tube in order to diagnose reflux esophagitis is described. After an overnight fast, the patient is given adequate sedation and analgesia and the GIF D_2 (Olympus Instruments) gastroscope is passed to the distal esophagus. With the patient in the left lateral position, the Rubins multipurpose biopsy tube is passed and, under direct vision, is placed at the biopsy site. Alternatively, the biopsy tube is passed

first to a distance of 40 to 42 cm distal to the incisor teeth, the gastroscope is passed next and the biopsy tube is then withdrawn to the biopsy site. After inspection of the esophagus the biopsy tube is placed at the biopsy site and suction is applied, collapsing the esophagus around the biopsy tube so that tissue can be obtained. After observing the area for 2 to 3 min for complications, both tubes are withdrawn. This method is advantageous in that it allows direct visualization of the abnormal area to be biopsied as opposed to performing a blind biopsy. The author also suggests that direct vision will decrease complications by eliminating blind sampling of fragile areas, and will also decrease the need for multiple biopsies.

8421 ENDOSCOPIC CHEMODIAGNOSIS: IMPROVEMENT IN THE RECOGNITION OF UPPER GASTROINTESTINAL DISORDERS. *(E.)* Simko, V.; Bertrand, G. (Upstate Medical Center, Syracuse, N.Y.). *Gastrointest. Endosc.* 22(1):14-17, 1975.

To rapidly assess intraluminal pH during gastrointestinal endoscopy, 115 unselected patients were consecutively examined using Congo-red indicator (CRI) and phenol-red indicator (PRI) applied to the mucosa under direct visualization. Most patients were premedicated with diazepam, meperidine hydrochloride, and a topical lidocaine spray on the pharyngeal mucosa; food and antacids were discontinued for at least ten hr before examination. CRI demonstrated an esophageal pH of less than 3.5 in only nine of the 115 patients, seven of whom had endoscopic evidence of esophagitis. Forty of the 115 patients had a gastric pH higher than 3.5; all patients with duodenal ulcer or bleeding esophagitis, half of those with either pyloroplasty with vagotomy or gastrojejunostomy, and one of five patients with gastroduodenostomy had a gastric pH of less than 3.5. Bleeding hemorrhagic gastritis and gastric ulcer tended to be associated with a gastric pH greater than 3.5. Acid secretory studies in 37 patients confirmed the diagnostic value of CRI. The topical application of betazole to the gastric mucosa during endoscopy had inconsistent results. The results of the endoscopic acid perfusion test of the esophagus were closely related to the presence of acid in the esophagus before the perfusion test. Acid reflux into the esophagus after filling the stomach with diluted HCL was observed in six patients, all of whom had endoscopic evidence of esophagitis; the three patients with no reflux from the stomach had no evidence of esophagitis. PRI established the diagnosis of alkaline esophageal reflux as the cause of esophagitis in two patients, neither of whom had evidence of acid in the esophagus or stomach when tested with CRI. *In vitro* studies with CRI and PRI showed that the indicators were reliable even at high dilution of the indicator with gastrointestinal secretions. It is concluded that endoscopic chemodiagnosis increases the diagnostic accuracy of upper gastrointestinal endoscopy while adding only minimally to the length and cost of the procedure.

8422 THE EFFECT OF PREMEDICATION WITH CERULEIN ON RADIOLOGICAL RESULTS IN INTRAVENOUS CHOLANGIOGRAPHY. *(It.)* Colagrande, C.; Parrella, R. E.; Cecconi, L. (Universita Cattolica S. Cuore, Istituto Radiologia, Rome, Italy). *Minerva Gastroenterol.* 20(3):97-106, 1974.

Intravenous cholangiography was performed on five male volunteers, aged 19-68 yr (mean age 49 yr). Conventional cholangiography was performed by injecting fasting subjects with 20 ml of a 50% solution of mixed sodium and methylglucamine salts of Ioglycamide over a three to five min period. Exposures were made after 20, 40, 60, 90, and 120 min. After five to ten days, the examination was repeated, but cerulein (0.1 µg/kg, diluted in 20 ml of physiological saline) was injected over a three to five min period 15 min before injection of contrast medium. The extent and intensity of urinary tract opacification, which was evident in four cases during conventional i.v. cholangiography, was reduced or eliminated by cerulein. In one case, cerulein improved opacification of the extrahepatic bile ducts and in another, the common bile duct was visualized only after injection of cerulein. In two other subjects, cerulein reduced the caliber of the common bile duct but had no effect on its opacification. Cerulein increased opacification of the gallbladder in all five cases. One subject showed definite evidence of a radiolucent gallstone only after the cerulein injection. Contrast medium was found in the duodenum in only two cases; the significance of this finding is unknown. Studies of changes in the area of the gallbladder revealed that gallbladder filling was decreased by cerulein in all three subjects 20 min after injection of the contrast medium but was increased by cerulein in two subjects 120 min after injection of the contrast medium. In a fourth subject, no appreciable change occurred in gallbladder filling; this subject was subsequently found to have extrahepatic cholestasis which was confirmed by a fat meal. In the fifth subject, cerulein decreased gallbladder filling and the area of the gallbladder decreased with time after injection of contrast medium. These findings indicate that cerulein premedication improves the results of i.v. cholangiography.

8423 COMPLICATIONS ASSOCIATED WITH ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY. *(E.)* Nebel, O. T.; Silvis, S. E.; Rogers, G.; Sugawa, C.; Mandelstam, P. (Naval Regional Medical Center, Box 323, San Diego, Calif. 92134). *Gastrointest. Endosc.* 22(1):34-36, 1975.

The complications associated with 3884 endoscopic retrograde cholangiopancreatography (ERCP) procedures were evaluated by the A/S/G/E research committee. The data were obtained by questionnaire from 404 members of the A/S/G/E. The overall complication rate in this series was 21.6/1000 cases. Complications included: pancreatitis (51 cases), cholangitis (25 cases), cardiopulmonary complications (4 cases), perforation (3 cases), bleeding (2 cases), medication reaction (7 cases), and submucosal injection (1 case). Analysis of the 51 cases of pancreatitis revealed no significant precipitating factors, although this complication was reported more frequently in patients with recurrent pancreatitis. In all but two instances, the pancreatitis was mild

and easily treated. There were no reports of cholangitis occurring in a radiologically normal biliary tree, and all 25 patients who developed cholangitis had common bile duct obstruction. The complications of perforation, bleeding, cardiopulmonary abnormalities, and drug reaction were similar to those seen in other endoscopic procedures. Five fatal complications were reported after ERCP: two patients with carcinoma of the pancreas developed pancreatic sepsis, one died of myocardial infarction and the other died as a result of the sepsis; two patients with carcinoma of the common bile duct developed cholangitis and died post-operatively; and cardiac arrest occurred during ERCP in a patient with atherosclerotic cardiovascular disease complicated by congestive heart failure. Because of the high frequency of sepsis, ductal obstruction demostrated by ERCP should be relieved by prompt surgical intervention. ERCP has proven to be a valuable new procedure in the clinical evaluation of a variety of pancreatic and biliary tract diseases. However, it may be associated with significant complications which must be carefully monitored and vigorously treated.

8424 INFUSION TOMOGRAPHY OF THE GALLBLADDER. *(E.)* Escobar-Prieto, A.; Barrera, A.; Cabrera, V. L.; Cohen, J.; Leal, P. (Hospital Clinica del Parque, Chihuahua, Mexico). *Surg. Gynecol. Obstet.* 141(3):340-346, 1975.

The accuracy of the radiologic technique of infusion tomography in the diagnosis of biliary tract disease in 45 adult patients with suspected pathology is reported. The patients were divided into the following four groups: those with acute symtoms who had infusion tomography as the inital diagnostic study; those with obstructive jaundice in whom previous existing studies could provide no reliable information and who were also having infusion tomography as the initial study; those with chronic relapsing symptoms and a non-visualized gallbladder on p. o. or i.v. cholangiograms; and those with proven calculi by p.o. and i.v. studies. Three normal patients served as controls. Prior to infusion, upper right quadrant tomograms were taken at two cm intervals. Then 2 ml/kg of standard water soluble, low sodium, iodized contrast (50-65%) was diluted in an equal amount of 5% dextrose and the mixture was given i.v. over a 15 min period. Immediately after infusion, repeat tomograms were taken at identical levels as before. In reviewing the films, a clearly opacified gallbladder wall with a thickness of more than 1 mm was abnormal (43 patients). At surgery on 37 of the 43, 33 patients had chronic and acute lithiasic cholecystitis; one had acute cholecystitis secondary to acute pancreatitis, two had chronic lithiasic cholecystitis; and one had a normal gallbladder. Of the two patients with normal gallbladders by tomography, one was found to have intrahepatic cholestasis and the other had acute lithiasic cholecystitis. Infusion tomography seems to be more specific in diagnosing gallbladder disease in comparison to conventional readiographic means. It is a quick study and ma have applications in emergency situations.

8425 THREE NEW TECHNIQUES FOR EXAMINING THE LIVER: HEPATIC ANGIOTOMOGRAPHY, HEPATOGRAPHY WITH LIPID-SOLUBLE CONTRAST MEDIUM, AND UMBILICOPORTAL SCINTIGRAPHY. *(Fr.)* Elghozi, L. (No affiliation given). *J. Chir. (Paris)* 108(4):369-380, 1974.

Three techniques to increase accuracy and validity in the diagnosis of liver ailments were investigated. Hepatic angiotomography has a double purpose: (1) study of the segmentary artery space, and (2) liver exploration for pathological anomalies. The angiotomography itself consists of sections every five mm (face and profile). Lipid-soluble hepatography investigates hepatic tissue in a precise and exact way. A total of nine planes (five face, four profile) were defined in relation to extra-hepatic constants. The information provided concerned: (1) the morphology of the liver and its intrahepatic elements, (2) the lobular or segmentary topography and (3) adjacent extrahepatic structures. The validity of this second method was tested experimentally and spaces greater than two mm in diameter could be detected. Umbilocoportal scintigraphy consisted of the injection of marked microspheres in the catherized umbilical vein. In this way, the different lobes of the liver were treated equally and there was no splenic retention of the microspheres. Its major importance is in measuring the venous shunt in cases of portal hypertension. Contraindications are persistence of the Arrantius canal, portal hemangioma or sinusoidal dilatation of the liver.

8426 LABELED METRONIDAZOLES AS POTENTIAL NEW AGENTS FOR AMEBIC HEPATIC ABSCESS IMAGING. *(E.)* Tubis, M.; Krishnamurthy, G. T.; Endow, J. S.; Stein, R. A.; Suwanik, R.; Blahd, W. H. (Veterans Admin. Wadsworth Hosp. Center, Los Angeles, Calif.). *Nucl. Med. (Stuttg.)* 14(2):163-171, 1975.

The development of a radiopharmaceutical capable of differentiating hepatic amebic abscesses from other space-occupying lesions of the liver by gamma-ray scintigraphy was investigated. The agents developed were ^{131}I-labeled bromometronidazole and a ^{99m}Tc-penicillamine-metronidazole complex. Toxicity studies for ^{131}I-bromometronidazole were conducted in mice. The animals were injected i.v. with 1800 times the weight of the comparable human dose at the rate of 2 mg/70 kg for man; they showed no ill effects. Rats injected with 2300 to 2600 times the comparable human dose showed no acute or chronic toxic symptoms. Neither were chronic toxicity symptoms noted in rats receiving 4000 times the human dose. Mice injected i.v. with ^{99m}Tc-penicillamine-metronidazole at 1 mg/20 g mouse, which represents 350 times the human dose, showed no toxic effects. Tests in rabbits and dogs likewise showed no evidence of toxicity. Organ distribution was studied using ^{131}I-brometronidazole in tissues and body fluids of mice and rats after the administration of the drug with or without loading doses of metronidazole. A rapid removal from the blood and clearance by way of the kidneys and liver were noted. In mice, loading with metronidazole resulted in retention in the liver, but with less excretion into the gallbladder, and showed that the liver cleared the drug at an almost constant rate. Human studies were conducted using a male patient with a space-occupying lesion which was indicated by a

Tc sulfur colloid ^{99m}Tc scintiphoto. An hepatic amebic abscess was suspected. He was scintiphotographed after i.v. administration of 300 μCi of ^{131}I-bromometronidazole and showed no uptake of the agent in the cold area. Surgery revealed a lymphoma. It is concluded that such compounds aid in distinguishing hepatic amebic abscesses from other space-occupying hepatic lesions and are therefore of aid in diagnostic work. It is not recommended that the compounds be used routinely, but rather that they may establish a diagnosis in doubtful cases.

8427 ULTRASONICALLY GUIDED PERCUTANEOUS ASPIRATION BIOPSY OF THE PANCREAS. *(E.)* Smith, E. H.; Bartrum, R. J., Jr.; Chang, Y. C. (Harvard Medical Sch., Boston, Mass.). *Radiology* 112(3):737-738, 1974.

A combined percutaneous biopsy and ultrasound technique resulted in a diagnosis of pancreatic lesions in a 75-yr-old woman who presented with a three-month history of left-sided pain and occasional nausea and vomiting. Ultrasound biopsy transducer examination and 23-gauge needle aspiration biopsy revealed a mass in the pancreatic tail. The procedure took five min and required only local skin anesthesia. The patient was symptom-free following the biopsy, which provided adequate preparations with good cellular preservation. Final cytologic diagnosis indicated malignancy and suggested pleomorphic carcinoma, giant cell type. Three hr after biopsy, laparoscopy revealed liver metastases; chemotherapy without surgery was suggested. Thus, in many cases of suspected pancreatic cancer, a percutaneous biopsy can provide a quick, definitive diagnosis with minimal risk and discomfort.

8428 THE CORRELATION BETWEEN BIOASSAY AND RADIOIMMUNOASSAY OF SERUM CHOLECYSTOKININ [abstract]. *(E.)* Johnson, A. G.; Marshall, C. E.; Dowsett, L.; Harvey, R. F. (Charing Cross Hosp. Med. Sch., England). *Gut* 16(5):398-399, 1975.

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8430 COMPARISON OF ENDOSCOPY AND UPPER GI SERIES IN DIAGNOSTIC ACCURACY AND THERAPY IN ACUTE UPPER GASTROINTESTINAL HEMMORHAGE [abstract]. *(E.)* Keller, R. T.; Logan, Jr., G. M. (Cleveland VA Hosp., Cleveland, Ohio). *Gastroenterology* 68(4):1034, 1975.

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See also, 8124, 8264, 8493, 8511, 8544, 8574, 8576, 8541, 8645, 8742, 8755, 8758, 8768, 8781, 8829, 8836, 8850, 8866, 8867, 8869, 8870, 8874, 8902, 8906, 8945, 8946, 8948, 8949, 8952, 8953, 8954, 9000, 9007, 9015, 9032, 9033, 9034, 9035, 9039, 9041, 9187, 9192, 9202, 9220, 9221, 9224, 9225, 9226, 9227, 9228, 9229, 9230, 9245, 9268, 9277, 9302, 9303, 9314, 9321, 9351, 9395, 9406, 9412, 9414.

GASTROINTESTINAL DISEASES

ESOPHAGUS

8478 CARCINOMA OF THE ESOPHAGUS. *(E.)* Rambo, V. B.; O'Brien, P. H.; Miller, M. C., III; Stroud, M. R.; Parker, E. F. (Medical Univ. South Carolina, 80 Barre St., Charleston, S. C. 29401). *J. Surg. Oncol.* 7(5):355-365, 1975.

Life tables were computed from South Carolina Tumor Registry data on 486 patients with proven squamous cell carcinoma of the esophagus, and the various factors involved in survival rate differences are described. Survival rates were plotted by age and sex; females had a slightly better survival rate than males (13% *vs* 8%). Blacks accounted for 73.4% of the cases, but survival rates were equal (11%) for both whites and blacks. Fifteen percent were private patients, indicating that socioeconomic factors may relate to incidence; however, there were no differences in survival rates based on socioeconomic factors. Localized lesions carried a better prognosis than advanced lesions (25% survival *vs* 5%) and localized lesions were 22.6% of the total. Thirty-three percent of the white group and 20% of the black group presented with localized lesions. In age comparisons, those 70 yr or older had the worst prognosis, whereas those 49 yr and younger had the best prognosis. Resectability rates were 32% of the total. The group with the most favorable prognosis was that receiving preoperative irradiation (36% five-yr survival rate). It is suggested that a randomized prospective study would be appropriate to conclude the best means of therapeutic management.

8479 TUMOR LOCALIZATION AND TREATMENT TECHNIQUE FOR CANCER OF THE ESOPHAGUS. *(E.)* Smoron, G. L.; O'Brien, C. A.; Sullivan, C. A. (Northwestern Memorial Hosp., Superior St. and Fairbanks Ct., Wesley Pavilion, Chicago, Ill. 60611). *Radiology* 111(3):735-736, 1974.

A new combination radiation therapy regimen is described for treatment of cancer of the middle and lower thirds of the esophagus, which limits the amount of spinal cord and lung exposure and thus, the subsequent morbidity. Treatment is begun using opposed mediastinal ports which include the entire esophagus. If supraclavicular or abdominal nodes are involved these are also included in the fields. The dose at tumor depth is 4000-4500 rads at 180 rads/day. When this is completed, 360 degree rotational therapy is planned and an additional 2000 to 2500 rads is given. The patient receives this rotational course in the prone position, which moves the esophagus anteriorly by 1.5 to 2.0 cm. The portal used is 6.0 cm wide at the isocenter. This treatment accomplishes two objectives: first, the dose to the spinal cord is kept within acceptable limits (i.e., the 20% isodose curve); and second, a high dose is not delivered to significant amounts of normal lung.

8480 RADIAL DISTRIBUTION OF ESOPHAGEAL PERISTALTIC PRESSURE IN NORMAL SUBJECTS AND PATIENTS WITH ESOPHAGEAL DIVERTICULUM. *(E.)* Dodds, W. J.; Stef, J. J.; Hogan, W. J.; Hoke, S. E.; Stewart, E. T.; Arndorfer, R. C. (Medical Coll. Wisconsin, Milwaukee, Wisc.). *Gastroenterology* 69(3):584-590, 1975.

The radial profile of peristaltic pressure waves in the esophageal body of five normal subjects and in six patients (3 men and 3 women, aged 30-70 yr) with esophageal diverticulum was determined. A manometric assembly featuring four radial side hole recording orifices oriented at equidistant 90 degree angles was used. Each recording catheter was infused with water at a rate of 6.1 ml/min which provided high fidelity pressure recording. The radially recorded peristaltic pressure complexes in normal subjects were similar in peak amplitude and wave form. The range of pressure differences among the four radial recordings averaged 9.0 mm Hg with a range of less than or equal to 25 mm Hg occurring in 99% of the observations. No consistent spatial orientation was noted in these variations in pressure amplitude. Of the six patients with esophageal diverticulum, the range of radial peristaltic pressure differences in five exceeded 25 mm Hg in the region of the diverticulum. The lowest pressure occurred at the recording orifice facing the diverticulum mouth. Abnormal wave forms featuring abrupt onsets or offsets were noted in occasional peristaltic sequences. It is suggested that these unusual wave forms are caused by oral-aboral diverticulum movement relative to the recording sensor during peristalsis. Abnormally high peristaltic pressure amplitudes (greater than 250 mm Hg) noted in two patients suggest that hypertensive peristaltic contractions may contribute to diverticulum production in some patients.

8481 ESOPHAGEAL INTRAMURAL PSEUDODIVERTICULOSIS. *(E.)* Beauchamp, J. M.; Nice, C. M.; Belanger, M. A.; Neitzschman, H. R. (Charity Hosp., 1532 Tulane Ave., New Orleans, La. 70140). *Radiology* 113(2):273-276, 1974.

The clinical and radiologic findings in three cases of "esophageal intramural pseudodiverticulosis" are described and some of the etiologic possibilities are discussed. The first case is that of an 83-yr-old Negro male with a history of weight loss and weakness. Physical and laboratory examinations showed him to be cachexic with an iron deficiency anemia. Esophagograms showed multiple small, narrow-necked outpouchings in the esophagus. Dysphagia developed after three yr and was progressive. Repeat esophagograms duplicated the initial findings; in addition there were findings compatible with a distal neoplasm. The second case was that of a 52-yr-old female with intermittent dysphagia of 25 yr

duration and the third case was that of a 52-yr-old Negro female with gradually increasing dysphagia. Both of these cases had radiograms similar to that of the first case. The common findings in all three cases were: dysphagia (over a variable period) and evidence of esophageal narrowing, as well as numerous, small outpouchings of the esophagus. The following histologic defects are suggested as being etiologic for the pseudodiverticuli: a) hyperplasia of the mucosa with protrusion through the muscularis similar to the Rokitansky-Aschoff sinuses in the gallbladder; b) dilatation of the esophageal mucous glands; and c) protrusion of pulsion diverticuli through existing neurovascular gaps. Elevated luminal pressure is also suggested as a cause. The association of *Candida albicans* with the diverticuli in two of the three cases is thought to be due to superinfection.

8482 ESOPHAGEAL INTRAMURAL PSEUDODIVERTICULOSIS. *(E.)* Boyd, R. M.; Bogaoch, A.; Greig, J. H.; Trites, A. E. W. (Shaughnessy Hosp., Vancouver, British Columbia, Canada). *Radiology* 113 (2):267-270, 1974.

The radiologic, endoscopic and autopsy findings in a 50-yr-old patient with intramural esophageal pseudodiverticulosis is reported. The patient presented with dysphagia of two yr duration. Esophagoscopy showed distal esophageal narrowing and many small, yellowish mucosal elevations throughout the esophagus. Review of 14 esophageal roentgen studies showed distal spasm and a large number of protrusions from the wall of the cervical esophagus to the carina. The small outpouchings had narrow necks projecting three mm from the lumen; larger outpouchings were also seen (flat-based and flask-shaped, with 4 mm orifices). Biopsy specimens showed deep crypts extending through the muscularis mucosa, and revealed chronic inflammation as well. At autopsy, the gross specimen showed nodular elevations over most of the mucosa. The esophageal mucous glands and ducts were microscopically shown to be widely dilated and a few of these had progressed to microabscesses. Inflammatory cells and necrotic debris were also seen in addition to cyst-like areas. The findings in eight other patients described in the literature were also reviewed. It was noted that the common finding in all of these cases was of numerous, flask shaped barium-positive projections, 2 to 3 mm in size. It is suggested that the initial esophagitis, followed by inflammation (which compresses excretory ducts in the esophagus), initiates the process. Abnormal motor activity due to esophagitis may subsequently cause strictures which in turn raise intraluminal pressure. It is suggested that this may be the pathophysiological mechanism of esophageal intramural diverticulosis.

8483 ROENTGEN FEATURES OF DYSPHAGIA AORTICA. *(E.)* Birnholz, J. C.; Ferrucci, J. T.; Wyman, S. M. (Harvard Medical Sch., Boston, Mass.). *Radiology* 111(1):93-96, 1974.

The radiographic appearance of involved thoracic structures is described in 30 patients with dysphagia aortica who were symptomatic for their disease. Four patients had descending aortic aneurysms, one had kinking of the proximal descending aorta with ectasia of the arch and ascending aorta, and the remainder had varying degrees of ectasia and tortuosity of the distal thoracic aorta; all had dysphagia and extrinsic compression of the distal esophagus. On roentgenograms of the chest, all patients had mild to moderate aortic dilatation. Twelve had left ventricular enlargement. Upright and supine esophagograms were performed. Fourteen patients demonstrated tertiary contractions of the esophagus. Partial to subtotal obstruction of the distal esophagus was a constant feature and persistent fluid levels and retained food were also noted in some cases. The inferior border of the barium column was smooth, sharply defined and exactly parallel to the course of the right lateral aspect of the aorta. Pulsatile displacement of the inferior barium margin was observed fluoroscopically. These characteristic findings should lend themselves to forming an approach to the diagnosis of this disorder.

8484 ELECTROMAGNETIC BOUGIENAGE TO LENGTHEN ESOPHAGEAL SEGMENTS IN CONGENITAL ESOPHAGEAL ATRESIA. *(E.)* Hendren, W. H.; Hale, J. R. (Massachusetts General Hosp., Boston, Mass.). *New Engl. J. Med.* 293(9):428-432, 1975.

In two infants with esophageal atresia, electromagnetic force was applied to metallic bougies in an effort to elongate the segments of the esophagus so as to permit their anastomosis at a later time without the risk of undue tension. The use of electromagnetic bougienage in these two cases avoided colon esophageal replacement. Bougienage lasted for 58 days in the first case, but was shortened to 30 days in the second. If use of this technique is anticipated, the gastrostomy site should be near the midline so that the lower pouch device will point straight upward in the mediastinum. It is suggested that this technique of intermittent, magnetically induced bougienage may be useful in treating infants with rectal atresia with a high pouch after a diverting colostomy is performed. Magnetism is not known to have any adverse effect on the patient. It is felt that this technique may be applicable for 10-20% of infants with esophageal atresia who are not suited for primary anastomosis. However, it is suggested that it is particularly advisable to monitor the electrocardiograms and electroencephalograms of patients exposed to magnetic fields for prolonged periods.

8485 EXPERIMENTAL GASTROESOPHAGEAL REFLUX IN THE AUSTRALIAN BRUSH-TAILED POSSUM. *(E.)* De Carle, D. J. (Prince Henry Hosp., Syndney, New South Wales, Australia). *Gastroenterology* 69(3): 625-629, 1975.

The effect of surgical division of the lower esophageal sphincter (LES) in the Australian brush-tailed

possum was studied manometrically, radiographically, and endoscopically. The effect of LES abolition by itself was determined. Adult animals were sedated with diazepam, 0.4 mg/kg, i.m., and LES activity was assessed. The animals were then sedated more deeply with ketamine hydrochloride, 10 mg/kg, i.m., and esophagitis was assessed visually. Gastroesophageal reflux was assessed radiographically. Within one wk of the initial assessment, five animals underwent cardioplasty and five others underwent sham operations. All animals were studied at two-wk intervals postoperatively until death or until 24 wk. Before operation, no animal had evidence of either gastroesophageal reflux or esophagitis. In the ten animals LES pressure was 12.6 mm of Hg. The sphincter was 0.5 to 1.0 cm long and the distance from the incisor teeth was 19.5 cm. In the sham-operated group there was no significant change in LES pressure from preoperative levels when the animals were restudied at 2, 4, and 6 wk postoperatively. There was no evidence of gastroesophageal reflux or esophagitis at any stage. In animals which had undergone cardioplasty, the zone of high pressure was no longer detectable at two wk and the animals had free gastroesophageal reflux. There was only mild esophagitis. At four to six wk, all had free reflux, still without a demonstrable zone of high pressure, and all had developed moderate esophagitis. This persisted for 10 to 12 weeks, when (4 animals) sphincter pressure reappeared and the gastroesophageal reflux was no longer detected. In these animals (by 16 and 20 weeks) esophagitis was no longer detected. In the fifth animal gastroesophageal reflux and severe esophagitis were still present at eight months. At six months a stricture of the lower esophagus was apparent. The model of gastroesophageal reflux used in this study is superior to previous models as the esophagus of the animal used closely resembles that of man. Further, the operation produced little anatomical derangement while it did produce a gross physiological change. This study provides direct evidence that absence of LES activity alone is sufficient to produce gastroesophageal reflux and esophagitis. It is suggested that the LES in man is also important in preventing gastroesophageal reflux.

8486 SURGICAL CORRECTION OF REFLUX. AN EFFECTIVE THERAPY FOR ESOPHAGEAL STRICTURES. *(E.)* Larrain, A.; Csendes, A.; Pope, C. E., II. (Hosp. J. J. Aguirre, Santiago, Chile). *Gastroenterology* 69(3):578-583, 1975.

The effect of an adequate antireflux operation (posterior gastropexy with cardia calibration) on the subsequent course of benign strictures of the esophagus was studied. The operation was performed on 24 patients (20 men and four women, aged 35-85 yr). Prior to surgery, pyrosis was experienced by 15 patients, pain by 15, regurgitation by 15, and dysphagia by 24. Respiratory symptoms were present in seven patients. Following surgery no patient experienced pyrosis, pain, or respiratory symptoms, only one experienced regurgitation and only three still had dysphagia. Prior to surgery, the diameter of the strictures measured less than 10 mm in 19 of the 24 patients, and remained so after operation in only one case. Radiological reflux, demonstrated in 19 patients before surgery, was found in only four after surgery. Sphincter pressure of less than 5 mm was recorded in 10 of 18 patients before and in none of 19 patients after surgery. Abnormal esophagoscopy was noted in 21 of 23 patients before and in no patient after operation. One 62-yr-old male was judged to have unsatisfactory surgical results, but refused reoperation. The only other patient who did not have satisfactory results, a 69-yr-old man, underwent reoperation during which the gastropexy was taken down, a cardiac calibration was added, and the gastropexy was reattached. This effort led to a satisfactory result with disappearance of dysphagia, an increase in the stricture diameter, and a decrease in the prestenotic dilation of the rest of the esophagus. From the results of this study in its concluded that posterior gastropexy with cardiac calibration has been shown to treat well-established, high grade strictures quite effectively without the need to resort to postoperative dilations. Since this operation does not have the higher mortality and morbidity of more formidable procedures such as interposition, it is suggested that this should be the procedure of choice in peptic strictures of the esophagus.

8487 SURGICAL TECHNIQUE FOR MANAGEMENT OF REFLUX ESOPHAGITIS AFTER ESOPHAGOGASTRECTOMY FOR MALIGNANCY--FURTHER APPLICATION OF ROUX-EN-Y PRINCIPLE. *(E.)* Smith, J.; Payne, W. S. (Mayo Graduate Sch. Medicine [Univ. Minnesota], Rochester, Minn.). *Mayo Clin. Proc.* 50(10):588-590, 1975.

The application of long limb Roux-en-Y drainage procedure in a patient with bile esophagitis following extensive proximal gastric resection with the retention of the antrum is described. The patient was a 50-yr-old woman who underwent esophagogastrectomy for a gastric adenocarcinoma. Continuity was restored by an end-to-end esophagogastrostomy with pyloroplasty. Although she was free of recurrent malignancy, the patient developed severe esophagitis with bile reflux and also became anorectic, nauseous, and exhibited weight loss. Through an upper midline incision, the patient's abdomen was entered and re-explored. The duodenum was transected distal to the pyloroplasty and the distal duodenal stump was closed. The right gastric and gastroepiploic vessels were preserved as the blood supply to the gastric remnant. An 18 inch Roux-en-Y anastomosis was then developed and joined end-to-end to the proximal part of the duodenum. Biliary and other secretions were thus diverted into the uppermost, closed end of the duodenum. The patient recovered and was asymptomatic thereafter. It is concluded that the long limb of the Roux-en-Y provides an effective peristaltic barrier to reflux of bile and other secretions from the small bowel into the stomach and esophagus.

8488 LONG-TERM RESULTS ON FUNCTION OF ESOPHAGOPLASTIES MADE FROM THE RIGHT HALF OF THE COLON. *(Rus.)* Zhupan, V. F. (S. M. Kirov Military Medical Acad., Leningrad, USSR). *Klin. Khir.* (2): 42-45, 1975.

Using the right half of the colon, esophagoplasties were performed on 47 patients with cicatricial stenosis of the esophagus and on 26 patients with esophageal cancer. Part of the ileum was included in 36 cases. Most patients with esophageal stenosis were between 20 and 40 yr old, while most of those with cancer were aged 40 to 70 yr. There were two surgical deaths: an eight-yr-old boy who died of shock and a cancer patient who died of cachexia. Long-term followups were performed in 58 cases: for three yr in 33 cases and for longer periods in 25. Barium passed through the artificial esophagus in one to five min in 42 patients and in 6-30 min in 16 with deep haustrations in the transplant. Transit was particularly slow in cases in which the transplant included more than 10 cm of the terminal ileum. Even in patients with gastroesophageal reflux who had antiperistaltic transplants, contrast medium never rose above the ileocecal valve when this valve was included in the transplant. In eight patients, an isoperistaltic segment of intestine (right colon alone in 2 patients, right colon with ileocecal valve in 6) was anastomosed directly to the glottis. No complications resulting from antiperistaltic activity of the transplant developed in any of these patients. For six yr after surgery, one patient with an antiperistaltic transplant suffered from regurgitation of the gastric contents into the mouth and respiratory tract. The gastric motility and stomach emptying time were decreased in all patients examined. In some patients, the stomach took as long as 24 hr to empty. Gastric atonia and pylorospasm are attributed to section of the vagus nerve when the esophagus was removed. Long-term followups on 57 of 71 patients with transplants of the right colon showed that 16 of the 19 cancer patients died of metastases and recurrences within one or two yr; only two patients survived five yr. Of the 38 patients with esophageal stenosis, eight survived from 13 to 18 yr, 16 from 9 to 12 yr, and 9 from 7 to 8 yr; the rest survived for shorter periods. The author drew no conclusions.

8489 ACHALASIA OF THE ESOPHAGUS: A REAPPRAISAL OF ESOPHAGOMYOTOMY VS FORCEFUL PNEUMATIC DILATION. *(E.)* Arvanitakis, C. (Univ. Wisconsin Sch. Med., Madison). *Am. J. Dig. Dis.* 20(9):841-846, 1975.

Fifty-six patients with achalasia of the esophagus who were treated over a 14-yr period by forceful pneumatic dilation (33 patients) or esophagomyotomy (23 patients) were followed for periods of 1-11 yr. The effectiveness of the 2 methods of treatment was evaluated by clinical, radiographic, and endoscopic criteria. Satisfactory results were achieved in 67% of the patients treated by pneumatic dilation, but the remaining 33% failed to show any subjective or objective improvement. Esophagomyotomy achieved satisfactory results in 3 of the patients in whom dilation was unsuccessful. Failure of forceful dilation commonly occurred in patients with long-standing, advanced achalasia. Resolution of dysphagia and improvement in the radiographic appearance of the esophagus occurred in the immediate postoperative period in 91% of the patients treated with esophagomyotomy. Dysphagia did not recur in any of the patients, nor were there any early or late postoperative complications. In the two patients in whom esophagomyotomy was unsuccessful, failure was attributed to advanced achalasia rather than to the surgical technique. Thus, esophagomyotomy is a more effective form of therapy than forceful pneumatic dilation in the treatment of achalasia. Esophagomyotomy carries a low morbidity and mortality rate and is an appropriate choice in the advanced stage of disease and in cases in which pneumatic dilation fails to produce significant clinical improvement.

8490 EVALUATION OF THE EFFECT OF FUNDOPLICATION ON THE INCOMPETENT LOWER ESOPHAGEAL SPHINCTER. *(E.)* Higgs, R. H.; Castell, D. O.; Farrell, R. L. (U.S. Naval Hosp., Phila., Pa.). *Surg. Gynecol. Obstet.* 141(4):571-575, 1975.

The effect of Belsy Mark IV fundoplasty on the competency of the lower esophageal sphincter was studied in seven adults with chronic gastroesophageal reflux as the only alimentary tract abnormality. All patients had sphincter pressures of less than 10 mm of Hg prior to surgery and ten persons without disease and with pressures greater than 10 mm of Hg were used as controls. Manometric readings of the gastroesophageal high pressure zone before and after surgery were obtained with a standard polyvinyl catheter arrangement. Intraluminal pressures were monitored continuously and mean pressures were calculated at one min intervals. Mean preoperative pressure was 5.8 mm of Hg and postoperatively was 15.6 mm of Hg with a control value of 16.2 mm of Hg. Mean percent relaxation of the gastroesophageal high pressure zone in response to ten dry swallows was also obtained before and after surgery. Preoperatively, patients had a 93.1% relaxation *vs* 86.4% postoperatively. The response to 80 µg/kg of edrophonium (i.v.) was also studied. The maximum pressure change in response to the drug, preoperatively, was an increase of 5.1 mm of Hg, and 10.0 mm of Hg postoperatively, *vs* a control level of 22.6 mm of Hg (a significant increase postoperatively). The response to a protein meal (100 g of lean beef) was also studied for 75 min after initiation of the meal; however, no significant differences between pre- and postoperative levels were noted. It is concluded that normotensive basal gastroesophageal high pressure readings are obtained after fundoplasty. This increase is attributed to improved function of the lower esophageal sphincter smooth muscle.

8491 THE CLINICAL SIGNIFICANCE OF CERVICAL ESOPHAGEAL AND HYPOPHARYNGEAL WEBS. *(E.)* Nosher, J. L.; Campbell, W. L.; Seaman, W. B. (Columbia-Presbyterian Medical Center, New York, N.Y.). *Radiology* 117(1):45-48, 1975.

An investigation was made of the incidence of cervical esophageal webs in a group of 55 patients (17 men and 38 women, aged 18-79 yr). Associated symptomatology and diseases in a large series of exam-

inations were also evaluated so that the clinical significance of the webs might be ascertained. A total of 1,000 consecutive 16-mm cineradiographies of the hypopharynx and cervical esophagus (taken at 9 frames/sec) were reviewed. One or more cervical esophageal or hypopharyngeal webs were diagnosed, an incidence of 5.5% in patients referred for upper gastrointestinal examination. Nine patients had multiple webs. There was no correlation with sex of the patient. Patients older than 50 yr had more webs than those under 50 yr. Although 11 patients complained of dysphagia, it was localized in the cervical esophagus and was thought to be attributable to the webs in only six cases. Of 48 patients for whom hematological data were available, 16 (5 men and 11 women) were anemic. While the overall incidence of iron deficiency anemia was increased in the patients with webs, the difference was not statistically significant. None of the seven patients with iron deficiency had dysphagia. The etiology of anemia in the 16 patients with webs included iron deficiency (7), acute gastrointestinal blood loss (5), multiple myeloma (2), glucose-6-phosphate-dehydrogenase deficiency (1), and chronic disease (1). Diagnoses of other diseases in patients with webs included hiatus hernia (10), peptic ulcer disease (7), hypertension (5), alcoholism (4), thyroid disorder (4), syphilis (3), diabetes mellitus (2), congestive heart failure (2), and rheumatoid arthritis (1). It is concluded that most hypopharyngeal and cervical esophageal webs have no relation to the Plummer-Vinson syndrome, iron deficiency anemia, pemphigoid, epidermolysis bullosa, or ulcerative colitis. It is suggested that these webs differ from those seen in inflammatory disorders, and (with the occasional exception of patients with dysphagia) that they are of no clinical significance.

8492 ALTERATION OF ESOPHAGEAL PERISTALSIS BY PENTAGASTRIN IN PATIENTS WITH DIFFUSE ESOPHAGEAL SPASM. *(E.)* Eckhardt, V. F.; Kruger, J.; Holtermuller, K.-H.; Ewe, K. (Depts. Medicine and Radiology, University of Mainz, Mainz, West Germany). *Scand. J. Gastroenterol.* 10(5):475-479, 1975.

The effects of exogenous pentagastrin on esophageal peristalsis were studied in nine patients with diffuse esophageal spasm (mean age, 60.3 yr), and in ten normal subjects (mean age, 54.6 yr). Manometric pressure recordings of esophageal peristalsis were obtained and respiration and swallowing was also observed. Peak amplitudes and duration of contractions (initiated by dry swallows) were recorded 20 min before and after drug injection. The effects of pentagastrin (6 µg/kg, s.c.) and Carbachol (0.125 mg/kg, i.m.) were studied. Pentagastrin was also administered as multiple, 30 sec i.v. doses from 0.02 to 0.4 µg/kg. With s.c. pentagastrin, mean peak amplitude increased to 31.2 mm of Hg in patients *vs* 12.1 mm of Hg in controls. Carbachol increased the mean peak amplitude to 25.1 mm of Hg in patients *vs* 6.3 mm of Hg in controls. The maximal duration of peristaltic contractions was increased by pentagastrin to 11.3 sec in patients *vs* 1.9 sec in controls, and by Carbachol, to 9.5 *vs* 3.3 sec. In seven patients, no changes were noted after injection of either drug. With i.v. pentagastrin, the dose-response curve showed significant differences only at the 0.4 µg/kg dose. Maximal amplitudes in response to this dose were 67.9 mm of Hg for patients and 39.1 mm of Hg for the controls, and the maximal duration of contractions increased from 12.6 sec (pre-injection) to 21.8 sec after injection. The results suggest that pentagastrin increases maximal amplitude and duration of peristalsis contractions in patients with diffuse esophageal spasm and that Carbachol, a cholinergic agent, produces a similar effect.

8493 DISCREPANT FINDINGS BETWEEN ESOPHAGOSCOPICAL AND X-RAY EXAMINATION ON THE SEARCH FOR VARICOSE VEINS OF THE ESOPHAGUS. *(Ger.)* Seckfort, H.; Crasemann, K.; Hennig, H. (Medizinische Klinik des Zweckverbandes Stadtund Kreiskrankenhaus Minden, 495 Minden, Germany). *Med. Klin.* 70(15):658-663, 1975.

8494 SIMULTANEOUS OCCURRENCE OF HIATUS HERNIA AND CARCINOMATA IN THE CARDIA AND THE ESOPHAGUS. *(Dan.)* Nilsson, T.; Halkier, E. (Dept. Thoracic Surgery, Copenhagen Municipal Hosp., Gentofte, Denmark).

8495 ETIOLOGY AND PATHOGENESIS OF ESOPHAGEAL DIVERTICULUM FISTULAS. *(Rus.)* Vantsyan, E. N.; Chissov, V. I. (Dept. Thoracic Surgery, I. M. Sechenov First Moscow Medical Inst., Moscow, USSR). *Khirurgiia* (5):103-108, 1975.

8496 PRE- AND POSTOPERATIVE MANOMETRIC STUDIES IN DIFFUSE ESOPHAGEAL SPASM. *(E.)* Paris, F.; Benages, A.; Berenguer, J.; Blasco, E.; Garrido, G.; Parrilla, P.; Ridocci, M. T.; Carbonell, C. (Hosp. "La Fe", Valencia, Spain). *J. Thorac. Cardiovasc. Surg.* 70(1):126-132, 1975.

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8498 CONGENITAL ACHALASIA OF THE OESOPHAGUS IN CHILDREN. *(E.)* Badrawy, R.; Abou-Bieh, A. (15, Tahrir Square, Cairo, Egypt). *J. Laryngol. Otol.* 89(7):697-706, 1975.

8499 REVERSED GASTRIC TUBE (RGT) ESOPHAGOPLASTY FOR FAILURE OF COLON, JEJUNUM AND PROSTHETIC INTERPOSITIONS. *(E.)* Heimlich, H. J. (Jewish Hosp. of Cincinnati, Ohio 45229). *Ann. Surg.* 182(2):154-160, 1975.

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8501 MECHANISM OF EXOPHAGITIS-INDUCED LOWER ESOPHAGEAL SPHINCTER HYPOTENSION [abstract]. *(E.)* Higgs, R. H.; Castell, D. O.; Eastwood, G. L. (US Naval Hosp., Philadelphia, Pa.). *Clin. Res.* 23 (3):250A, 1975.

8502 DETECTION OF GASTRO-OESOPHAGEAL REFLUX BY CONTINUOUS RECORDING OF pH IN THE LOWER PORTION OF THE OESOPHAGUS. *(Fr.)* Stanciu, C. (Hull Royal Infirmary, Hull, England). *Arch. Fr. Mal. App. Dig.* 64(2):125-130, 1975.

8503 GASTROESOPHAGEAL REFLUX IN LATE PREGNANCY [abstract]. *(E.)* Hey, V. M.; Sharp, D. S.; Ostick, D. G.; Skinner, L.; Ganguli, P. C.; Cowley, D. J. (Patterson Laboratories, Manchester, England). *Gut* 16(5):403-404, 1975.

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8506 MONILIAL AND HERPES ESOPHAGITIS IN ONCOLOGY PATIENTS [abstract]. *(E.)* Carter, E.; Rajendra, G.; Schuster, M. M. (Baltimore City Hosp., Baltimore, Md.). *Gastroenterology* 68(4):1045, 1975.

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8509 FIBEROPTIC GUIDED WIRE DILATATION OF BENIGN AND MALIGNANT ESOPHAGEAL STRICTURES [abstract]. *(E.)* Olsen, H. W.; Lawrence, W. A. (Providence Hosp., Oakland, Calif.). *Gastroenterology* 68(4):1039, 1975.

8510 BARRETT'S EXOPHAGUS, SUSPECTING THE DIAGNOSIS ON ENDOSCOPY [abstract]. *(E.)* Mangla, J. C.; Desbaillets, L. G. (Monroe Comm. Hosp., Rochester, N. Y.). *Gastroenterology* 68(4): 1037, 1975.

8511 ENDOSCOPIC PLACEMENT OF ESOPHAGEAL PROSTHESIS [abstract]. *(E.)* King, J. F. (Timken Mercy Hosp., Canton, Ohio). *Gastroenterology* 68(4):1035, 1975.

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8519 PRESSURE-DIAMETER (P-D) AND LENGTH-TENSION (L-T) CHARACTERISTICS OF THE HUMAN LOWER ESOPHAGEAL SPHINCTER: EFFECT OF FUNDOPLICATION [abstract]. *(E.)* Biancani, P.; Zabinski, M. P.; Behar, J. (VA Hosp., West Haven, Conn.). *Gastroenterology* 68(4):862, 1975.

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8531 TOTAL LIGATION OF THE ESOPHAGUS WITH MURPHY'S BUTTON: BLEEDING FROM ESOPHAGEAL VARICES CAUSED BY PORTAL HYPERTENSION. 34 CASES. *(Fr.)* Gignoux, M.; Bricard, H.; Verwaerde, J. C.; Valla, A. (Centre Hospitalier, 14000 Caen, France). *Med. Chir. Dig.* 3(5):325-327, 1975.

8532 TREATMENT OF ESOPHAGEAL ATRESIA. *(Fr.)* Jaubert de Beaujeu, M. (Hopital Debrousse, 69322 Lyon Cedex 1, France). *Lyon Chir.* 71(4):291-298, 1975.

8533 THE EFFECT OF ALGINATES OVER THE GASTROESOPHAGEAL REFLUX IN HIATAL HERNIA. *(Sp.)* Mazure, P. A.; Sferco, A.; Chiocca, J. C. (Servicio de Gastroenterologia Policlinico "Prof. Alejandro Posadas," Martinez de Hoz y Perdriel, Haedo, Buenos Aires, Argentina). *Acta Gastroenterol. Latinoam.* 6(2):69-72, 1974.

8534 APERISTALSIS OF THE ESOPHAGUS: SYSTEMATIZATION OF SYNCHRONOUS COMBINED SURGERY BY TWO SURGICAL TEAMS. *(Por.)* Pimenta, L. G. (Cirurgiao do Hosp. Maternidade "Santa Rita," Brasil). *Folha Med.* 69(5):501-504, 1974.

8535 CHAGASIC MEGAESOPHAGUS IN CHILDREN. CLINICAL ASPECTS. *(It.)* Jorge, J.; Santana, E.; Rosa, H.; Sampaio Teixeira, A.; de Rezende, J. M. (Academica do curso medico, Universidade Federal de Goias., Brazil). *Rev. Goiana Med.* 20(3/4):171-190, 1974.

8536 ASSOCIATION OF MEGAESOPHAGUS AND CARCINOMA: THE CLINICAL FEATURES OF A CASE OF MEGAESOPHAGUS ASSOCIATED WITH CARCINOMA ARE DESCRIBED. *(It.)* Paoli, P.; Nannelli, U. (Ospedale Generale di Zona, Firenze, Italy). *Osp. Ital. Chir.* 27(2/3):79-83, 1974.

See also, 8420, 8450, 8475, 8579, 8604, 8606, 8608, 8641, 8649, 8650, 9142, 9179, 9312, 9315, 9330, 9343, 9369, 9379.

8537 THE SIALIC ACID AND CARBOHYDRATE CONTENT AND THE SYNTHESIS OF GLYCOPROTEIN FROM RADIOACTIVE PRECURSORS BY TISSUES OF THE NORMAL AND DISEASED UPPER INTESTINAL TRACT. *(Eng.)* Roberts, S. H.; Heffernan, C.; Douglas, A. P. (Royal Victoria Infirmary, Newcastle upon Tyne, NE1 4LP England). *Clin. Chim. Acta* 63(2):121-128, 1975.

The incorporation of [^{14}C]glucose into human gastric and jejunal mucosa obtained by peroral biopsy was used to study the biosynthesis of glycoproteins in these tissues and to determine the suitability of this method for investigating abnormalities in human disease. Fresh tissue fragments were incubated in Krebs medium III containing labeled glucose, as well as unlabeled streptomycin, L-glutamate, penicillin, kanamycin, and/or rifampicin. The precipitate was homogenized, dialyzed, and analyzed by scintillation counting. The labeled sugars in the postincubation material were identified by descending paper chromatography; bacteria were also identified in the mucosal fragments after incubation and the tissue specimens were examined histologically. The gastric mucosal samples contained a larger amount of sialic acid/mg of protein and a smaller amount of total hexose/mg of protein than did the jejunal mucosal samples. The tissues from patients with and without peptic ulcers did not differ chemically, and there were no chemical differences between normal jejunal mucosa and jejunal mucosa from patients with treated and untreated celiac disease. Gastric biopsies obtained without aseptic precautions incorporated 7% or more of the radioactivity when incubated with [^{14}C]glucose. Much of this incorporation was abolished by the addition of antibiotics to the incubation medium. There was great variability in the amount of radioactivity incorporated by the gastric mucosal specimens, but there was no correlation between incorporation and disease or histological diagnosis. Ribose was always labeled in tissues incorporating [^{14}C]glucose, even in those specimens from which bacteria could not be cultured. These ribose peaks were small, however, and large peaks were found corresponding to galactose and fucose. Similar results were found with the jejunal mucosal samples. In four subjects, gastric juice samples were sterile, but in three of these patients, organisms were isolated from the biopsy specimens. The results suggest that bacteria may normally be present in the mucous layer of the stomach and that bacteria make a major contribution to the *in vitro* incorporation of radioactive glucose into glycoprotein. This method is not suitable for the study of *de novo* synthesis in either gastric or jejunal mucosa.

8538 GASTRIC OPERATIONS AND GLUCOSE HOMEOSTASIS. II. GLUCAGON AND SECRETIN. *(Eng.)* Bruer, R. I.; Zuckerman, L.; Hauch, T. W.; Green, W.; O'Gara, A. M.; Lawrence, A. M.; Foa, P. P.; Matsuyama, T. (Evanstown Hosp., Evanstown, Ill. 60201). *Gastroenterology* 69(3):598-606, 1975.

The serum glucose, immunoreactive insulin (IRI), pancreatic glucagon (IRG), and glucagon-like immunoreactivity (GLI, presumably of gastrointestinal origin) levels were measured after p.o. glucose (100 g) in normal subjects and in patients who had undergone gastric surgery (antrectomy or pyloroplasty with truncal vagotomy) for duodenal ulcer at least one yr previously. In some tests, p.o. glucose administration was followed by a 26-min infusion of secretin. The mean fasting serum glucose, IRI, IRG, and GLI levels did not differ significantly among the three groups of subjects and the mean i.v. glucose k values (after 25 g glucose were injected in 2 min) were similar. Thus, the response of the pancreatic islets to direct glucose stimulation was unaltered by the surgical procedures in the duodenal ulcer patients. The early hyperglycemic response to p.o. glucose and the associated elevation of plasma GLI were much greater and the IRI levels were slightly higher in the surgical patients than in the normal subjects. A nonsignificant decrease in the IRG level was noted in all groups after p.o. glucose. In the gastrectomy patients, secretin infusion during repeated p.o. glucose tolerance tests partially corrected the hyperglycemia and lowered the plasma GLI and IRI level; secretin in these patients had no effect on the peak or cumulative IRG levels. During secretin infusion, the gastrectomy subjects noted less severe symptoms of dumping than during the standard test. Secretin had no effect on the alimentary hyperglycemia or hormonal responses in the vagotomy and pyloroplasty patients nor in the normal controls. The data indicate that intolerance to p.o. glucose after gastric surgery may be related to elevated GLI levels, and that the beneficial effect of secretin may be due to its ability to decrease these levels.

8539 CARDIAC CHANGES DURING 2-DEOXY-D-GLUCOSE TEST: A STUDY IN PATIENTS WITH SELECTIVE VAGOTOMY AND PYLOROPLASTY. *(E.)* Burckhardt, D.; Stalder, G. A. (Medizinische Universitäts-Poliklinik, Hebelstrasse 1, CH-4056 Basel, Switzerland). *Digestion* 12(1):1-8, 1975.

The detailed effect of i.v. 2-deoxy-D-glucose (2-DG) on the heart was studied by investigating the questionable arrhythmogenic action of 2-DG and the influence of 2-DG on myocardial contractility. A total of 37 patients were tested at periods of 6 to 12 months following selective vagotomy and pyloroplasty. None of the 27 patients in whom a continuous ECG recording with the Holter-Avionic system was performed showed a serious arrhythmia such as ventricular tachycardia, idioventricular rhythm, nodal rhythm, atrial fibrillation or atrial flutter, either before or after administration of 2-DG. Of the patients having atrial or ventricular premature contractions in their tracings before and/or after administration of 2-DG, the total number of premature beats was not increased by 2-DG. In nine patients, the ECG remained completely unchanged throughout the recording period. The only significant ECG changes after 2-DG administration were T-wave flattening and QT prolongation. Known vagal effects such as bradycardia, lengthening of the PR interval, or A-V blocks were not seen in this study. Serious arrhythmias were not provoked by 2-DG, since none of the 27 patients so tested for

rhythm disturbances showed atrial fibrillation, atrial flutter, nodal or idioventricular rhythm. No cardiodepressive action was noted. On the contrary, myocardial contractility was enhanced, as evaluated by the systolic time intervals. It is concluded that since no serious effects on the ECG, cardiac conduction, or impulse formation were noted after 2-DG administration, and considering the slight increase in myocardial contractility, 2-DG is viewed as a safe drug when given to patients with no known heart disease under the age of 60. It is urged, however, that this drug be given only under strict observation.

8540 THE EFFECTS OF ACETYLSALICYLIC ACID ON THE HUMAN GASTRIC MUCOSA AS REVEALED BY GASTROCAMERA. *(E.)* Edmar, D. (Sahlgren's Hosp., S-413 4S Göteborg, Sweden). *Scand. J. Gastroenterol.* 10(5):495-499, 1975.

The effects of a buffered solution of acetylsalicylic acid and of a conventional disintegrating tablet on the gastric mucosa were investigated using a gastrocamera. The study was performed in eight healthy volunteers (7 men and 1 woman, aged 24-33 yr) with no history of upper gastrointestinal disturbances. The study was performed as a crossover comparison between two forms of acetylsalicylic acid: a conventional tablet containing 0.5 g acetylsalicylic acid and 0.07 g heavy magnesium oxide; and an effervescent tablet containing 0.5 g acetylsalicylic acid, 0.5 g citric acid, and 1.25 g sodium bicarbonate. When dissolved in water, the former tablet had a pH of about 3; the latter had a pH of about 6. The dosage used was 1 g acetylsalicylic acid three times/day for three days. After a three-week interval, the same procedure was repeated with the other test preparation. Of the seven subjects who took tablets without buffer, all had multiple and prominent erosions following administration of the tablets. After taking the buffered solution, four were without visible erosion, three had a few localized erosions, and one had multiple and prominent erosions. Blood clots were present in the gastric juice of all seven subjects after taking unbuffered tablets. After the buffered solution, blood clots were found in three of the eight cases. The mean plasma concentration of salicylate analyzed two hr after the last dose of tablets was 127 µg/ml. The corresponding value after the buffered solution was 90 µg/ml. Pronounced side effects did not occur in any subject after medication. Three complained of a slight feeling of repletion after buffered dosages, but two of these reported the same feeling after taking the tablets. Hunger feelings after both preparations were reported in one subject, and heartburn occurred in one after taking the unbuffered preparation; heartburn did not occur in any patients after buffered acetylsalicylic acid. A slight epigastric burning sensation occurred in one on the third day after administration of the tablets. It is concluded that any person taking conventional acetylsalicylic acid tablets in the dose regimen studied runs a risk of developing lesions of the gastric mucosa. This risk is lessened when acetylsalicylic acid is taken in the form of a buffered solution.

8541 PARENTERAL ASPIRIN PRODUCES AND ENHANCES GASTRIC MUCOSAL LESIONS AND BLEEDING IN RATS. *(E.)* Meeroff, J. C.; Paulsen, G.; Guth, P. H. (VA Wadsworth Hosp. Center, Los Angeles, Calif. 90073). *Am. J. Dig. Dis.* 20(9):847-852, 1975.

The effect of parenteral sodium acetylsalicylate (Na ASA, 15 or 60 mg/kg, i.p.) on the development of gastric mucosal lesions and bleeding was studied in 20 male Sprague-Dawley rats and in 30 rats subjected to cold-restraint stress three hr after drug injection. Ten rats, injected with saline, i.p., served as controls. Rats injected with 60 mg/kg Na ASA developed significantly more lesions (mean lesion score, 8.2) than both the control animals (0.2) and the rats injected with 15 mg/kg Na ASA (2.5). Only two of the ten control animals developed lesions. Both doses of Na ASA produced a significantly greater blood loss (decrease in hematocrit value) than the control, but the two dose levels did not differ significantly. Rats subjected to cold-restraint alone developed a large number of stomach lesions; the addition of 15 mg/kg Na ASA did not significantly increase the number. However, lesion formation in the cold-restraint group was significantly increased by 60 mg/kg Na ASA. Both doses of Na ASA caused greater blood loss than saline. The results suggest that parenteral aspirin in small doses has an effect on hemostasis, while larger doses may work directly on the gastric mucosa.

8542 ANTRAL GASTRITIS. *(E.)* Turner, C. J.; Lipitz, L. R.; Pastore, R. A. (Fitzsimons Army Medical Center, Denver, Colo.). *Radiology* 113(2):305-312, 1974.

In an effort to improve diagnostic accuracy of the routine upper gastrointestinal series in patients with gastric antral disease, a review was made of 19 patients (11 men and 8 women, aged 15-61 yr) in whom the upper series had been negative but in whom endoscopy had disclosed superficial antral disease. The study revealed a clinical pattern of antral gastritis that had not been previously reported. Three radiologic patterns were found to be reliable indicators of antral disease: a flattened or narrowed antrum indicating loss of one or both of the prepyloric shoulders (particularly at the lesser curvature); antral mucosal crenulation (the antrum demonstrating a wrinkled or irregularly corrugated appearance); and abnormal peristalsis, manifested as antral spasm. Any of the above antral findings constituted radiological diagnosis of antral gastritis. At endoscopy, three abnormal patterns were also observed: patchy, erythematous inflammation of the antrum; shallow, punched-out, aphthous ulcers in the antrum; and a "spoke-wheel" erythematous reaction, which appeared as linear streaks of erythema radiating proximally from the pylorus on all walls. The previous belief that if an abnormality does not persist throughout the examination it is probably not real is doubtful. Even a transient antral deformity may represent significant superficial mucosal disease. It is concluded that antral gastritis is a distinct clinical entity; that antral gastritis can be reliably diagnosed by routine fluoroscopic examination,

obviating the need for endoscopy; and that the diagnosis of antral gastritis will substantially increase the yield of positive findings at fluoroscopy.

8543 ADENOMYOSIS OF THE GASTRIC ANTRUM IN CHILDREN. *(E.)* Bush, W. H., Jr.; Hall, D. G.; Ward, B. H. (Children's Orthopedic Hosp. and Medical Center, Seattle, Wash.). *Radiology* 111(1): 719-181, 1974.

Adenomyosis of the gastric antrum occurring in three children (2 boys and 1 girl, aged 2 mo to 8.5 yr) is presented. At laparotomy in one case, a 1 cm nodule in the submucosa was excised. Pathological study showed this material to be aberrant pancreatic tissue. In the second case, laparotomy revealed an intramural mass with intact mucosa adjacent to the pylorus, which was pathologically identified as a mixed tumor of indeterminant type. In the third case, laparotomy showed a raised mass in the antrum and a fibrous tumor was removed from the submucosa. Pathology revealed adenomyosis, characterized by large bundles of smooth muscle surrounding multiple clusters of benign-appearing glands and mildly dilated ducts. It is suggested that adenomyosis of the gastric antrum is a single entity encompassing a histological spectrum from the poorly differentiated tumor or adenomyoma to the well differentiated aberrant pancreas and Brunner's gland hyperplasia. It appears as an ovoid, smooth, sharply marginated tumor in the gastric antrum. A central dimple or niche, though infrequent, defines the well differentiated lesion from the leiomyoma. It is suggested that adenomyosis of the gastric antrum occurs more frequently in the pediatric patient than has been previously recorded.

8544 THE RETAINED GASTRIC ANTRUM. *(E.)* Dunlap, J. A., Jr.; McLane, R. C.; Roper, T. J. (Greenville Memorial Hosp., Greenville, S. C. 29602). *Radiology* 117(2):371-372, 1975.

A case of retained gastric antrum in a 53-yr-old man is reported. The patient presented with severe epigastric pain, nausea, and vomiting. He had a long history of peptic ulcer disease with earlier hospitalizations for closure of perforated ulcer, subtotal gastric resection and vagotomy, revision of gastrojejunostomy, and closure of a gastrojejunocolic fistula. An upper gastrointestinal series showed a marginal ulcer, a retained gastric antrum with complete filling of the afferent loop, and well-defined gastric mucosal folds. A gamma camera image of the upper abdomen following i.v. ^{99m}Tc pertechnetate (5 ml) demonstrated activity in the gastric pouch and a second area of activity to the right of the midline, indicating functioning gastric mucosa in the retained antrum. At laparotomy a remnant of antrum was resected. The specimen showed well-preserved rugal architecture with good preservation of the gastric mucosa and muscularis. The patient did well postoperatively. Any patient with chronic, recurrent peptic ulceration following subtotal gastric resection and gastrojejunostomy should have an adequate upper gastrointestinal series with complete filling of the afferent loop. I.v. ^{99m}Tc pertechnetate is a noninvasive technique which aids in the identification of a retained gastric antrum.

8545 ENDOSCOPIC DIAGNOSIS OF "CALIBRE-PERSISTENCE", A RARE CAUSE OF MASSIVE GASTRIC HEMORRHAGE. *(E.)* Domján, L.; Biliczki, F.; Lóránd, P.; Cserényi, L.; Bordás, F. (County Hosp., Kecskemet, Hungary). *Endoscopy* 7(3):169-173, 1975.

Emergency endoscopy, performed as part of a standard hospital routine, was used to obtain correct diagnoses in three patients (one woman and two men, aged 21-83 yr) suffering from massive gastric hemorrhage. In the first patient, an 83-yr-old male who suddenly vomited a large amount of blood, endoscopy revealed a tumor-like lesion, 15-18 mm in diameter, covered with blood and mucus 5 cm distal to the cardio-esophageal junction on the anterior wall. The patient died in cardiac failure. Necropsy revealed a superficial erosion covered with a blood clot of 14 mm diameter. After removing the clot, a large vessel, 0.6 mm in diameter, was visible in the center of the erosion. Histology disclosed dilated arteries without arteriosclerotic changes lying below the mucosa, which was superficially ulcerated at the point where the artery approached the surface. Adjacent mucosa showed moderate inflammatory changes. The analysis of this case enabled more accurate diagnoses by endoscopy to be made in the following two cases. Endoscopy on one patient revealed arterial hemorrhage from the center of an erosion when the abdomen was firmly pressed. This sign, as well as the absence of tortuous arterial segment in the vicinity of the erosion which would be characteristic of gastric aneurysm, supported the possibility of caliber-persistence. In the third case, endoscopy revealed a small erosion, covered with a cap of thrombus, at 5 to 6 cm below the cardia on the posterior wall. By jetting ice water through a teflon tube, the thrombus was removed and arterial hemorrhage started from an abnormally dilated artery located in the center of the erosion. Endoscopic diagnosis was caliber-persistence. It is noted that effective management of acute upper gastrointestinal hemorrhage depends on accurate diagnosis. With the use of emergency endoscopy the cause of hemorrhage can be established in 80 to 95% of the cases. In caliber-persistence, the main pathological alteration is the presence of an oversized artery just beneath the mucosa and the erosion is only secondary. Caliber-persistence is not demonstrable by radiologic techniques. Exact diagnosis can be established only by endoscopy.

8546 RECURRENT GASTROINTESTINAL BLEEDING IN OSLER'S DISEASE SUCCESSFULLY TREATED BY ENDOSCOPIC ELECTROCOAGULATION IN THE STOMACH. *(E.)* Weingart, J.; Lux, G.; Elster, K.; Ottenjann, R. (I. Med. Abt. Stadt. Krankenhaus Munchen-Neuperlach, 8 Munchen 83, Oskar-Maria-Graf-Ring 51, Germany). *Endoscopy* 7(3):160-164, 1975.

Endoscopic electrocoagulation was used in the treatment of a 42-yr-old female patient known since age 37 to have hereditary telangiectasia. The patient had been repeatedly hospitalized for frequently re-

curring gastrointestinal bleeding. On esophago-gastro-duodenoscopic examination, more than 30 angiomas were found, located predominantly in the fundus and antrum of the stomach, any or all of which might have been potential sources of bleeding. An emergency gastrotomy with ligation of bleeding vessels had had no effect on the course of her disease. Neither had any success been achieved through the use of iron preparations, clotting agents and avascular membrane-active substances. During an esophago-gastroscopic examination, the button-tipped coagulation probe was used at a medium current intensity to coagulate 15 to 20 angiomas. During a second session, several more mucosal angiomas in the fundus and antrum were treated with the coagulation probe. Following this treatment, two further episodes of gastointestinal bleeding were noted within three months, both of which stopped spontaneously. In the following 21 months, no further gastrointestinal bleeding occurred and hospitalization or blood transfusions were no longer needed. At this time esophago-gastroduodenoscopic examination was performed as part of the follow-up procedure, and the coagulation probe was used to treat 15 further angiomas in the stomach. It is suggested that the endoscopic electrocoagulation of bleeding "Osler angiomas" in the stomach should always be attempted before resorting to surgery.

8547 MENETRIER'S DISEASE: REPORT OF A CASE WITH TRANSIENT AND REVERSIBLE FINDINGS. *(E.)* Lesser, P. B.; Falchuk, K. R.; Singer, M.; Isselbacher, K. J. (Harvard Medical Sch., Boston, Mass.). *Gastroenterology* 68(6):1598-1601, 1975.

A case of Menetrier's disease which resolved spontaneously over a three-wk period is reported. Shortly after eating a crabmeat sandwich, a 49-yr-old woman suddenly developed nausea and vomiting which lasted five days. Ten days after the onset of vomiting, she began to notice bilateral ankle edema, which extended to her groin and was accompanied by weight gain. She also noted cramping abdominal pain which was relieved by frequent feeding and pruritus of one leg without a skin rash. There were no stigmata of liver disease. An upper gastrointestinal series demonstrated enormous, irregular, nonulcerated, distorted gastric folds extending from the fundus to the antrum along the lesser and greater curvature. The small bowel appeared normal. Biopsies through an endoscope demonstrated cystic dilation of the more basally oriented glands. Excretion of i.v. [^{51}Cr]albumin in the stools was increased to 11.6% and the serum protein and albumin concentrations were reduced. The patient was placed on a low salt-high protein diet. Within three wk of the start of her illness she felt better, the leg edema had decreased markedly, and she was free of abdominal pain. The serum protein and albumin levels increased to normal values; a repeated upper gastrointestinal series two months from the onset of the disease showed a marked decrease in the size of the gastric folds, and a repeat [^{51}Cr]albumin study showed a decrease in excretion to 1.4%. The patient developed some pruritus, edema, and a rash at the chromium injection site. The patient is currently symptom-free with normal serum protein levels. This patient has the classical features of Menetrier's disease. A hypersensitivity reaction may have been involved in the pathogenesis of the gastric protein loss.

8548 HL-A3 AND HL-A7 IN PERNICIOUS ANAEMIA AND AUTOIMMUNE ATROPHIC GASTRITIS. *(E.)* Mawhinney, H.; Lawton, J. W. M.; White, A. G.; Irvine, W. J. (Dept. Therapeutics, Univ. Edinburgh, Edinburgh EH3 9YW, Scotland). *Clin. Exp. Immunol.* 22(1):47-53, 1975.

The results of a study of 29 patients (25 women and 4 men) with pernicious anemia and 46 patients (45 men and 1 woman) with autoimmune atrophic gastritis without evidence of vitamin B12 malabsorption are presented. In pernicious anemia there was a significant increase in the frequency of HL-A7 and of the HL-A3,7 haplotype compared to controls. A smaller increase in the frequency of HL-A3 was not statistically significant. In atrophic gastritis there was a similar, but statistically insignificant, increase in the frequency of HL-A3. There was no tendency for the frequency of HL-A7 or of the HL-A3,7 haplotype to be increased in the atrophic gastritis group. There was no increase in the frequency of any other HL-A specificity in either group of patients or in the series as a whole. The incidences of gastric parietal cell antibody and intrinsic factor antibody in pernicious anemia correspond to those normally found. Due to the bias in the selection of patients for gastric analysis, the incidence of both antibodies in atrophic gastritis was considerably higher than usual. No HL-A specificity was found associated with an increased incidence of either autoantibody compared with the overall incidence in either patient group or in the series as a whole. The increased frequency of HL-A3 in the whole series of patients with pernicious anemia or uncomplicated atrophic gastritis demonstrated in this study confirms the association of HL-A3 with gastric autoimmune disease. The association of pernicious anemia, but not of autoimmune atrophic gastritis, with HL-A7 and the HL-A3,7 haplotype would suggest that the progression from autoimmune atrophic gastritis to pernicious anemia is under the influence of an HL-A-linked gene.

8549 PHYTOBEZOARS OF THE SMALL BOWEL FOLLOWING GASTRIC SURGERY. *(E.)* Moskowitz, H. (Mount Sinai Hosp., Hartford, Conn.). *Radiology* 113(1):23-26, 1974.

Two cases of bezoars composed of partially-digested orange segments are reported and pertinent literature is reviewed. A 64-yr-old woman, 14 yr postgastrectomy with a Bilroth II anastomosis, and a 56-yr-old woman, 16 yr postgastrectomy, were admitted with signs and symptoms of small bowel obstruction. Both patients were edentulous and complained of crampy abdominal pain. Abdominal films were characteristic of mechanical obstruction with distended loops of small bowel with air-fluid levels at different heights. A mottled density with numerous lucencies was noted in the right lower quadrant of both patients. At operation, a large bezoar was removed from the distal small bowel corresponding to the density on abdominal

film. Pathological analysis revealed various forms of fibrous matter including partially digested orange slices. Obstruction of the small bowel by bezoars appears to be dependent upon the physical characteristics of the bolus, the condition of the teeth and the absence of pylorus, with 90% of reported phytobezoars due to oranges. The ileum, being the narrowest part of the small bowel with the least forceful peristaltic waves and being an area of water resorption, is a likely spot for obstruction. Loss of pyloric function with consequent decrease in time spent in the stomach, decreased acid and enzyme activity, along with poor mastication are important contributory factors. Phytobezoars could be eliminated in 90% of postgastrectomy patients by improved chewing habits and avoidance of citrus fruits.

8550 THE RADIOLOGIC MANIFESTATIONS OF PSEUDOLYMPHOMA OF THE STOMACH. *(E.)* Chiles, J. T.; Platz, C. E. (Dept. Radiology, Univ. Chicago, Chicago, Ill.). *Radiology* 116(3):551-556, 1975.

The clinical records and radiographs of 14 men and four women (average age at diagnosis, 51 yr) with gastric pseudolymphoma were reviewed. Most patients had a long history of gastrointestinal complaints (mean, 11 mo) and some had noted a recent increase in severity. Gastroscopy was performed in 14 cases; the ulcerated mass was diagnosed as a benign ulcer in five of these, as a carcinoma in three, and as questionably neoplastic in six. In 4 of 5 patients in whom gastric biopsy was performed, the report was chronic gastritis or inflammation; in 9 of 10 patients, cytological examination was considered negative for malignant cells. Treatment included at least 50% gastrectomy in 15 cases, local resection in one, simple biopsy in two, and radiation therapy in seven. The initial pathologic diagnosis was pseudolymphoma or benign lymphoid hyperplasia in nine patients, and malignant or possibly malignant lymphoma in nine. Eleven patients were alive without evidence of lymphoma 4 to 22 yr after the original diagnosis; one other patient died from a pulmonary *Aspergillus* infection following radiotherapy and chemotherapy for a presumed malignant lymphoma, and another died from metastatic rectal adenocarcinoma. The radiographic findings appeared to fall into three relatively distinct groups: tumor masses (7 cases); enlarged gastric rugae (6 cases); and benign-appearing ulcers (5 cases). The initial radiographic diagnosis was carcinoma in four cases, malignant lymphoma in three, benign submucosal tumor in one, indeterminate lesion in three, and benign ulcer in five. Ulceration was described at gross examination in all 16 cases in which the entire lesion was available, and in seven cases multiple ulcers or erosions were noted. The lesion(s) was found in the antrum (6 patients) or along the lesser curvature (3 patients), often extending onto the anterior and/or posterior surfaces (6 patients). The radiographic appearance did not correlate well with the findings at gross examination. All of the cases were histologically characterized by proliferation of lymphoid tissue, usually in an irregular or nodular pattern in relation to varying amounts of fibrous tissue. Lymphocytes predominated, but scattered plasma cells and eosinophils were often present. The lymphoid proliferation was limited to the submucosa in eight cases, involved the muscularis propria in five cases, and involved the serosa in five. Vascular sclerosis or thrombosis strongly suggested chronic peptic ulcer disease in 12 cases. The findings support the suggestion that pseudolymphoma of the stomach is most often a reaction to chronic peptic ulcer disease.

8551 PRIMARY GASTRIC TUBERCULOSIS: A CASE REPORT. *(E.)* Page, R. E.; Williams, R. E.; Benson, E. A. (General Infirmary, Leeds, England). *Br. J. Surg.* 62(8):618-620, 1975.

The case report of a 34-yr-old man with primary gastric tuberculosis was presented in order to emphasize the difficulty in diagnosing this disorder. Two barium meal examinations within 10 months failed to identify gastric tuberculosis; however, the second test meal revealed a constant filling deformity in the antral region. Gastroscopy visualized a flat sloughing lesion of obscure nature in the pyloric antrum. Laparotomy revealed a firm, infiltrating lesion in association with lymph node enlargement around the coeliac axis, left gastric artery and subpyloric region. The condition was diagnosed as carcinoma of the stomach with secondaries on the terminal ileum. Partial gastrectomy and small bowel resection followed. Staining of sections with auramine phenol fluorescent technique (a funnel section of stomach, 11 x 11 cm and a tube of small intestine, 35 cm long x 5 cm diameter) revealed the presence of tubercle bacilli in the lesion. Postoperative antituberculosis chemotherapy was instituted and the patient made a satisfactory recovery.

8552 METASTATIC DISEASE INVOLVING THE STOMACH. *(E.)* Menuck, L. S.; Amberg, J. R. (Univ. Hosp., Univ. California Sch. Medicine, La Jolla, Calif.). *Am. J. Dig. Dis.* 20(10):903-913, 1975.

The incidence, primary sites, symptoms, and effects of palliation in metastatic disease of the stomach were investigated in 22 patients. Metastatic disease involving the stomach was found at autopsy in 17 patients (of 1010 autopsies of patients with cancer) and by clinical diagnosis in five patients. The primary malignancies found at autopsy were melanoma and cancers of the lung, breast, pancreas, testis, and ovary. Ten of the 17 patients did not seem to have clinically significant metastatic disease; in the other 7 cases, epigastric pain, melena, and anemia were the most common clinical manifestations. Radiographic studies of the upper gastrointestinal tract in 13 of the 17 patients revealed normal radiographic findings in three, solitary polypoid lesions in five, multiple sites of involvement of the stomach in three, and lesions of an infiltrative type in two. Gastric metastases of breast carcinoma and melanoma show distinctive radiographic patterns; an infiltrating "linitis plastica" pattern is seen in about 50% of the gastric metastases from carcinoma of the breast. Melanoma metastatic to the stomach often develops multiple, small ulcerating masses (a "bull's-eye" configuration).

Although nonspecific epigastric pain and melena were the symptoms that most commonly led to the proper diagnosis, radiographic examination of the gastrointestinal tract is essential. The radiographic findings are usually sufficient to suggest the diagnosis.

8553 ENDOCRINE-TYPE GRANULES IN CELLS OF GLOMUS TUMOR OF THE STOMACH. *(E.)* Kim, B. H.; Rosen, Y.; Suen, K. C. (State Univ. New York Downstate Medical Center, Brooklyn, N. Y.). *Arch. Pathol.* 99(10):544-547, 1975.

Electron microscopy was used to describe the ultrastructure of a glomus tumor removed from the pyloric region of a 57-yr-old woman. A moderate number of mast cells were irregularly scattered throughout the tumor. Electron microscopy revealed round or oblong tumor cells arranged in lobules or sheets around dilated blood vessels. Amorphous structures resembling basement membrane were seen surrounding individual and grouped tumor cells. The protoplasmic membranes of the cells showed many pinocytotic vesicles. The cytoplasm contained a moderate number of mitochondria with swollen cristae, dilated endoplasmic reticulum, numerous filaments with focal condensations, endocrine-type granules bound by a single membrane, rudimentary cilia, and centrioles. In most cells, pinocytotic vesicles were obvious. Filaments with focal condensations or as individual scattered fibrils were noted in many cells. In about 80% of the cells, endocrine-type granules were diffusely scattered throughout the cytoplasm; these were often in greater concentration adjacent to the Golgi complex. The majority of the granules were of uniform density and surrounded by a single membranous structure. Higher magnification showed fine granular subunits arranged in a wavy pattern. Occasional granules showed very darkly staining aggregates of these subunits. Cilia were found in only a few tumor cells. They were of rudimentary nature and were located adjacent to the centrioles. The presence of the endocrine-type granules suggests that these tumor cells possess not only contractile properties but also secretory activity.

8554 ENDOSCOPIC REMOVAL OF BENIGN GASTRODUODENAL TUMOURS. *(E.)* Moulinier, B.; Faivre, J.; Marchat, F.; Lesbros, F.; Lambert, R. (Edouard Herriot' Hosp., F-69374 Lyon, France). *Endoscopy* 7(3):121-125, 1975.

The clinical results and complications associated with the endoscopic resection of benign gastroduodenal tumors were studied in 71 men and 60 women with a total of 150 apparently benign gastroduodenal tumors. The age range was 18 to 82 yr, and 37 were followed up for periods up to 30 days. In 114 cases, a single polyp was found; the most common gastric location was the antrum (87 of 127 cases) and the most common duodenal locations were the bulb and genu superius (16 of 23 cases). Recuperation of the polyp was possible in 129 cases. In the stomach, endoscopic resection was generally carried out for adenomatous polyps; malignancy was observed in only four cases. In the duodenum, resection was generally carried out for a tumor developed from Brunner's glands; no malignancy was observed. Complications included breaking of the diathermic snare during the section in three cases, pain and epigastric distress following the procedure in five cases, fever following the procedure in three cases, incarceration of the snare necessitating surgery in one case, and severe bleeding following section in six cases. The diathermic section was followed by the development of a yellowish scar or ulceration which healed gradually within three to four wk. A piece of the stalk remained in cases in which the polyp was pediculated. The clinical data indicate that polypectomy is a safe procedure which allows an accurate histological diagnosis and determination of the best management procedure. The procedure is indicated in cases of small (less than 2 cm) adenomatous polyps in the stomach and duodenum.

8555 GASTRIC ACID SECRETION FOLLOWING RENAL TRANSPLANTATION. *(E.)* Canavan, J. S. F.; Briggs, J. D.; Bell, P. R. F. (Western Infirmary, Glasgow G11 6NT, Scotland). *Br. J. Surg.* 62(9): 737-740, 1975.

The effect of immunosuppressive therapy on gastric acid secretion after renal transplantation was studied. During a 4½-yr period, renal transplants were carried out on 71 patients (42 men and 29 women, aged 16-47 yr). After transplantation they received prednisolone in decreasing doses (200 mg on day 1, to 40 mg on day 17, with a slower reduction thereafter to 15 mg at 3 months). Prednisolone (1 g) was given i.v. at the time of transplantation and was repeated to a maximum of 6 to 8 g during rejection episodes. Azathioprine was given as a single daily dose which ranged from 25 to 200 mg. All patients received aluminium hydroxide (30 ml) every four hr for the first month after transplantation. Of these 71 patients, ten were selected at random for gastric acid studies (5 men and 5 women, aged 20-45 yr). Barium meal studies were performed in eight of these ten and revealed a duodenal ulcer in one patient. Four of the ten patients had dyspepsia before transplantation and one developed dyspepsia following his transplant. In men, the mean basal acid output was 3.8 mEq/hr before and 3.4 mEq/hr after transplantation. Both values were greater than those in normal subjects. Corresponding figures for women were 1.2 and 1.4 mEq/hr, resp., not significantly different from controls. In pretransplant studies, the mean peak acid output following pentagastrin administration (6 μg/kg, i.m.) was 37.2 mEq/hr in males and 26.3 mEq/hr in females. No significant change occurred following transplantation in peak acid output. Maximal acid concentration was slightly higher in both males (116 mEq/l) and females (104 mEq/l) on regular dialysis than in normal subjects. This did not change significantly after transplantation. In the series of 71 patients, the incidence of hemorrhage from peptic ulcer was 7%. One of these patients had a perforation. That no further increase in acid output occurs following transplantation despite a

high intake of steriods suggests that steroids may not exert their ulcerogenic effect through increased acid secretion.

8556 INCIDENCE OF STRESS ULCER FORMATION ASSOCIATED WITH STEROID THERAPY IN VARIOUS SHOCK STATES. *(E.)* Jama, R. H.; Perlman, M. H.; Matsumoto, T. (Hahnemann Medical Coll. and Hosp., 230 North Broad St., Philadelphia, Pa. 19102). *Am. J. Surg.* 130(3):328-331, 1975.

A retrospective evaluation of the incidence of gastrointestinal bleeding associated with the use of pharmacologic doses of steroids in various shock states was undertaken. Patients in clinical shock resulting from sepsis, hemorrhage, or cardiac failure were included. The patients were divided into three groups, depending on the type of steroid therapy that had been given. Group I (8 women and 9 men, aged 21-82 yr) received the standard shock regimen plus Decadron (5 mg/kg) or Solu-Medrol (30 mg/kg) given as a bolus, and then repeated every four to six hr for 24 to 36 hr. Group II (6 women and 6 men, aged 17-75 yr) received the standard shock regimen plus hydrocortisone (1.4 mg/kg), Solu-Medrol (1.8 mg/kg), or Decadron (0.7 mg/kg) every four to six hr for an average duration of 96 hr. Group III (8 women and 11 men, aged 21-85 yr) received standard shock management without steroid therapy. There was a 57.9% incidence of acute gastric ulceration in group III, compared with a 33.3% incidence in group II and a 5.9% incidence in group I. Hemorrhage was not a prominent feature in group I patients. However, 25% of those in group II and 45.9% in group III experienced severe gastric bleeding. No significant difference in mortality was found between groups I and II, 82.3 and 83.3%, resp. However, a 94.7% mortality was noted among patients in group III. The results suggest that there is a considerably lower incidence of stress ulceration with the use of steroids in pharmacological doses, compared with the incidence when lesser doses of steroids are used and when no steroids are used. This population was statistically atypical in that all patients were in the shock state and experiencing the most severe form of physiologic stress. The authors suggest that the initial insult in the formation of gastric ulcers during stress may be a decrease in perfusion of the gastric mucosa (the acute gastric vasoconstriction syndrome) that results in mucosal ischemia. This ischemic mucosa is then subject to increased gastric secretions, increased gastric acidity, delayed gastric emptying, bile reflux, or one of the other factors currently considered to be related to gastric ulceration. It is suggested that the usefulness of steroids lies in their ability to reduce the amount of arteriovenous shunting when administered in pharmacological doses.

8557 PREVENTION AND TREATMENT OF STRESS EROSIONS AND STRESS ULCER WITH GEFARNATE (GERANYL FARNESYLACETATE). *(Ger.)* Markoff, N.; Infanger, K.; Cahannes, M.; Herwig, W. (Loestrasse 135, CH-7000 Chur, Switzerland). *Praxis* 63(52): 1573-1576, 1974.

A double-blind study was performed to determine whether gefarnate is of value in the prevention and treatment of stress erosions and stress ulcers in patients suffering from trauma and in those undergoing major surgery. Gefarnate was administered in 50 mg doses to 19 of 23 patients with trauma, starting when these patients were hospitalized. Stress ulcers developed in 2 of the 19 treated patients and in two of four controls who received placebos. Gefarnate was also administered to 26 of 29 patients with septic infections or who were undergoing tumor or biliary tract surgery. Treatment was begun as soon as possible before surgery and was continued for three wk postoperatively. Bleeding stress ulcers developed in 2 of the 26 treated patients and in two of the three controls. Statistical analysis of the results demonstrated that stress ulcers occurred significantly more often in controls than in patients receiving gefarnate. Five case reports are also presented to illustrate the effect of gefarnate on chronic duodenitis, gastritis, and duodenal ulcers. Treatment with gefarnate (50 mg twice a day, i.m. for 7 days) alleviated severe chronic duodenitis in a 53-yr-old woman. Symptomatic improvement occurred in a 37-yr-old man with chronic antral gastritis who received gefarnate. Recovery occurred without the use of diet or abstinence from nicotine and moderate quantities of alcohol, but a recurrence developed when gefarnate therapy was discontinued. Subjective improvement occurred in a 39-yr-old man with a chronic recurrent duodenal ulcer after p.o. administration of gefarnate for about 1.5 months. No radiological evidence of an ulcer was found on followup. A 39-yr-old woman with acute erosive gastritis became asymptomatic after two blood transfusions and i.m. administration of 50 mg of gefarnate twice a day for 12 days. Administration of gefarnate (50 mg three times a day, p.o.) to a 71-yr-old man with an 11-yr history of recurrent duodenal ulcers produced symptomatic improvement within one week, but a recurrence developed after therapy was discontinued. Therapy was resumed and, nine months later, was finally discontinued since the patient had no further recurrences.

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8615 HEMORRHAGIC GASTRITIS CAUSED BY LOCALIZED INTRAVASCULAR COAGULATION IN THE COURSE OF "CRYPTOGENIC INFLAMMATORY CIRRHOSIS." *(Fr.)* Testart, J.; Hemet, J.; Metayer, P. (C.H.R., 1, rue Germont, 76000 Rouen, France). *Sem. Hop. Paris* 51(18):1235-1241, 1975.

8616 REOPERATION IN DUMPING SYNDROME FOLLOWING BILLROTH II GASTRECTOMY. *(Ger.)* Herzog, K. H.; Brinckmann, W.; Pietsch, P.; Sewcz, H.G. (Bereich Medizin, Univ., 25 Rostock, Germany). *Z. Gesamte Inn. Med.* 30(13):433-437, 1975.

8617 INTESTINAL OBSTRUCTION RESULTING FROM PHYTOBEZOARS IN GASTRECTOMIZED PATIENTS: TWO CASES. *(Fr.)* Bouliane, R.; Lapointe, A. (Centre hospitalier universitaire Laval, 2705, boulevard Laurier, Quebec, Canada). *Union Med. Can.* 104(8): 1237-1240, 1975.

8618 GASTRIC CARCINOMA. *(Ger.)* Hammer, B. (Kantonsspitals, CH-9006 St. Gallen, Switzerland). *Munch. Med. Wochenschr.* 117(31):1279-1284, 1975.

8619 SEVERE AND PROLONGED PARALYSIS OF THE STOMACH AND DUODENUM FOLLOWING CHOLECYSTECTOMY. *(Fr.)* Pouyet, M.; Treboux, M.; Rea, B. (Clinique Claude-Bernard, 69600 Oullins, France). *Lyon Chir.* 71(4):254-255, 1975.

8620 THE CANCER REGISTRY OF CALI COLOMBIA--EPIDEMIOLOGIC STUDIES OF GASTRIC CANCER. *(Eng.)* Correa, P.; Bolanns, Q.; Garcia, F. T.; Gordillo, G.; Duque, E.; Cuello, C. (No affiliation given). *Rec. Results in Cancer Res.* 50:155-169, 1975.

8621 RADIOTELEMETRIC INVESTIGATIONS OF GASTRIC pH IN GASTRIC DISEASES. *(Rus.)* Khadzhikov, V. S.; Khonelidze, G. B. (Moldavian Res. Inst. Oncology, Kishinev, USSR). *Klin. Med. (Mosk.)* 53(4):65-69, 1975.

8622 ACID SECRETORY FUNCTION OF THE STOMACH IN PATIENTS GIVEN LONG-TERM PREDNISOLONE THERAPY. *(Rus.)* Minushkin, O. N. (I. M. Sechenov 1st Moscow Medical Inst., USSR). *Klin. Med. (Mosk.)* 53(4):60-64, 1975.

See also, 8109, 8189, 8406, 8415, 8442, 8445, 8450, 8452, 8472, 8487, 8490, 8494, 8500, 8502, 8503, 8512, 8518, 8533, 8625, 8627, 8628, 8631, 8633, 8637, 8641, 8644, 8649, 8658, 8712, 8717, 8719, 8721, 8903, 8999, 9013, 9205, 9269, 9279, 9315, 9318, 9328, 9330, 9343, 9359, 9369, 9385, 9406, 9414.

STOMACH

Peptic Ulcers

8623 FACTORS RELEVANT TO THE PROGNOSIS OF CHRONIC GASTRIC ULCER. *(E.)* Piper, D. W.; Greig, M.; Coupland, G. A. E.; Hobbin, E.; Shinners, J. (Dept. Medicine, Univ. Sydney, Sydney, Australia). *Gut* 16(9):714-718, 1975.

The effects of complete healing, ulcer size, initial healing rate, age, sex, smoking, and aspirin intake on the natural history of chronic gastric ulcer were studied in 105 chronic gastric ulcer patients. The patients were followed up by postal questionnaire, and those who complained of recurrent abdominal symptoms were subsequently examined radiologically. In addition, 60 patients were studied on an inpatient basis to determine the initial rate of ulcer healing. Ulcer recurrence was present in 15 of the 60 patients discharged with the ulcer healed and in 25 of the 45 patients discharged with the ulcer unhealed. The incidence of large ulcers (greater than 51 mm^2) was significantly greater in those discharged with the ulcer unhealed, but the recurrence rate was twice as great in the unhealed group compared with the healed group regardless of ulcer size. The frequency of recurrence was not correlated with the initial rate of ulcer healing, continued cigarette smoking, continued analgesic ingestion, sex, or age. Similarly, sex and age had no effect on initial ulcer size. The results indicate that complete healing of a gastric ulcer by medical treatment may reduce the subsequent morbidity due to gastric ulcer by about 1/2.

8624 THE INCIDENCE IN COPENHAGEN COUNTY OF GASTRIC AND DUODENAL ULCERS IN THE SAME PATIENTS. *(E.)* Bonnevie, O. (Gentofte Univ. Hosp., Hellerup, Denmark). *Scand. J. Gastroenterol.* 10(5):529-536, 1975.

A prospective, epidemiologic study was conducted to determine the incidence of persons with both gastric and duodenal ulcers in a geographically well-defined population comprising 1/10 of the Danish population. The study was carried out in Copenhagen County during the period January 1, 1963 to December 31, 1968; only those residents born between January and June were included. During this period, 1905 new patients with ulcer disease were identified. In 80 patients (Category I) both a duodenal and gastric ulcer were diagnosed at the first "positive" diagnostic examination, while in 47 cases (Category II) the primary and "secondary" ulcers were recognized at different examinations in the period 1963 to 1968, and in 46 cases (Category III) a primary ulcer was recognized before 1963 and a secondary ulcer was recognized during the period 1963 to 1968. Among the total 173 cases involving both gastric and duodenal ulcer, the two ulcers coincided at a given time in 121 cases. In all categories, a sex ratio of about 2.1:1 was observed, and in all categories and among both sexes the median age was 56 yr. The age distribution was similar to that for solitary gastric ulcer, but was significantly higher than that for solitary

duodenal ulcer. The median period from the time of symptomatic debut to diagnosis of ulcer disease was significantly longer for Category I (3 yr) than for Categories II or III (1 yr each). In Categories II and III, the interval between diagnosis of the two ulcers was four yr or less in 50% of the cases. There was a significant increase in the number of gastric and duodenal ulcer patients between 1963 (0.98/10,000 inhabitants) and 1968 (1.24/10,000 inhabitants). The total annual incidence was 1.15/10,000 inhabitants or 1.55/10,000 at risk aged 15 yr or greater. In all age groups there was a relatively constant predominance of men and in both sexes the incidence was greatest between 30 and 60 to 69 yr. The ratio of the incidence of solitary duodenal ulcer, solitary gastric ulcer, and simultaneous duodenal and gastric ulcer was 8:2:1. The data suggest a definite relationship (possibly a common determining factor) between the two types of ulcer.

8625 OBSERVATIONS OF GASTRIC MUCOSAL BLOOD FLOW USING $^{99}Tc^{m}$ IN RAT AND MAN. *(E.)* Taylor, T. V.; Pullan, B. R.; Elder, J. B.; Torrance, B. (Manchester Royal Infirmary, Manchester, England). *Br. J. Surg.* 62(10):788-791, 1975.

The value of ^{99m}Tc clearance as a measurement of gastric mucosal blood flow and as a discriminant of gastric function in various disease states was assessed in 15 pylorus-ligated Wistar rats and in 30 human patients (17 with duodenal ulcer, 5 with gastric ulcer, 3 with normal stomachs, 2 with gastritis, and 3 cases of hypochlorhydria). In the rat study, a bolus of [^{14}C]-aminopyrine, tritiated quinine, or ^{99m}Tc was injected i.v. and samples of venous blood and the stomach contents were obtained at 15-min intervals for one hr. The samples were analyzed by scintillation counting. In the human study, 1 mCi of ^{99m}Tc was given i.v. and samples of venous blood and gastric juice were obtained every 15 min for two hr. During the second hr, pentagastrin (6 µg/kg) was given s.c. The samples were analyzed by scintillation counting, and the gastric samples were analyzed by acidity. The rat studies showed no difference in the clearance rates of [^{14}C]-aminopyrine, tritiated quinine, or ^{99m}Tc and indicated a lack of toxicity for the latter. In the human studies, pentagastrin-induced increases in acid secretion were associated with a rise in pertechnetate clearance; the increased clearance tended to precede the rise in acid secretion rate. The mean ^{99m}Tc clearance rate after pentagastrin administration was 70.9 ml/min in the duodenal ulcer patients and 16.6 ml/min in the gastric ulcer patients. The mean clearance rate in the normal subjects was intermediate between these values and low clearance rates were associated with a previous Polya gastrectomy, a gastric carcinoma, and a case of pernicious anemia. In the duodenal ulcer patients, comparison of basal and stimulated ^{99m}Tc clearance with maximal acid output indicated that ^{99m}Tc clearance may be a more precise discriminant of gastric function than acid secretion. The correlation between mucosal ^{99m}Tc clearance and maximal acid output was 0.73 for the human subjects as a group but only 0.29 for the duodenal ulcer patients. The results suggest that pertechnetate clearance is directly related to gastric mucosal blood flow and that its measurement may prove to be a more accurate discriminant in cases of peptic ulceration than the conventional measurement of gastric acid secretion.

8626 A RELATION BETWEEN THE ENERGY OF FOOD AND GASTRIC EMPTYING IN MEN WITH DUODENAL ULCER. *(E.)* Stubbs, D. F.; Hunt, J. N. (Guy's Hosp. Medical Sch., London, England). *Gut* 16(9):693-694, 1975.

The half times of gastric emptying of a variety of meals in normal men and in men with duodenal ulcers were compared based on data from nine literature sources. The half times were calculated using a value of 4 Kcal/g of carbohydrate and/or protein/ml of meal and 9 Kcal/g of fat/ml of meal as the energy density of the food or test solution. It was found that the greater the energy density of the meal, the shorter was the observed half time in the patients with duodenal ulcer relative to the normal subjects. At zero calories the difference between the two groups was not significant. The data support the view that the slowing of gastric emptying by duodenal receptors is less in men with duodenal ulcers than it is in healthy men.

8627 LOCATION, HEALING, AND RECURRENCE OF GASTRIC ULCERS IN RELATION TO FUNDAL GASTRITIS. *(E.)* Tatsuta, M.; Okuda, S. (Center Adult Diseases, Osaka, Japan). *Gastroenterology* 69(4):897-902, 1975.

The endoscopic Congo red test was used to study the influence of fundal gastritis on the location, healing, and recurrence of gastric ulcers in 101 outpatients with benign gastric ulcers and 59 patients with healed ulcers. Each patient was given 20 mg of scopolamine butyl-N-bromide s.c. and 40 mg of dimethylpolysiloxane p.o. About 1/2 hr later, Congo red and 5% sodium bicarbonate solution were sprayed into the stomach, AOC-tetragastrin (5 µg/kg) was given, and the gastric mucosa was observed through a gastroscope for 15 to 30 min. Fundal gastritis was classified as absent to severe and gastritic changes were classified as superficial gastritis, atrophic gastritis, or gastric atrophy. All areas of mucosa which were discolored by the Congo red were found to be histologically normal, whereas all nondiscolored areas were either pyloric or fundic mucosa which had been altered by severe superficial or atrophic gastritis. Thirty-three of 40 high-lying ulcers were located in fundic mucosa associated with atrophic gastritis and/or gastric atrophy; none was located in the pyloric mucosa. In contrast, most of the 11 antral ulcers were located in the pyloric mucosa, none being found in fundic mucosa altered by gastritis. There was a close correlation between the extent of fundal gastritis and the location of the gastric ulcer: in general, fundal gastritis was extensive when the ulcers were located

in the proximal portion of the stomach near the cardiac orifice. The extent of fundal gastritis was also correlated with the healing of ulcers three months after the beginning of medical treatment; 81.3% of those associated with moderate fundal gastritis and 85.7% of those associated with severe gastritis healed completely within three months. During a two-yr follow-up period, ulcer recurrence was found in 31.8% of the cases studied. While recurrence was observed in only one case in which the original ulcer was not associated with fundal gastritis, the recurrence rate was 58.3% in those with severe gastritis. The results support the view that HCl may be important for the healing of gastric ulcers. They also suggest that factors causing a decrease in the mucosal defensive barrier may be more important for the recurrence of ulcers than aggressive factors such as HCl.

8628 BENIGN GASTRIC ULCER IN A PATIENT WITH PERNICIOUS ANEMIA. *(E.)* Manier, J. W.; Beltaos, E. (Marshfield Clinic, Marshfield, Wisc. 54449). *Gastroenterology* 69(3):744-745, 1975.

A 81-yr-old woman presented with epigastric pain of six-month duration. The presence of a benign gastric ulcer was diagnosed, associated with achlorhydria and documented pernicious anemia. The anemia was established by a Histalog-fast achlorhydria, a Schilling test of 2.1% excretion of tagged vitamin B_{12} in a 24-hr urine, and reticulocytosis after cyanocobalamine administration. Gastric volume was 40 ml, no acid was present, and the pH was 8.1 after the administration of Histalog, 1.5 mg/kg. At gastrectomy the ulcer, which had been demonstrated by gastroscopy, was confirmed. No malignancy was found on histological examination of the ulcer and the remainder of the stomach. It is concluded that the patient suffered from an ulcer, but that it was not acid-produced. It is suggested that bile regurgitation coupled with alcohol ingestion produced the ulcer. Due to the known increased incidence of gastric carcinoma in patients with pernicious anemia, surgical investigation of the ulcer was deemed mandatory.

8629 ANTACID VS PLACEBO IN HOSPITALIZED GASTRIC ULCER PATIENTS: A CONTROLLED THERAPEUTIC STUDY. *(E.)* Butler, M. L.; Gersh, H. (Tripler Army Medical Center, Honolulu, Hawaii). *Am. J. Dig. Dis.* 20(9):803-807, 1975.

In a prospective controlled study, the efficacy of a liquid antacid (a mixture containing 200 mg aluminum hydroxide, 200 mg magnesium hydroxide, and 20 mg simethicone per 5 cc) in relieving pain and promoting healing of gastric ulcers was studied. Gastric ulcer patients were subjected to panendoscopy and mucosal biopsy on hospitalization and three wk after the beginning of antacid or placebo therapy. Medication (1 oz) was given every two hr while the patient was awake. Of the placebo group, eight had healed their ulcers within three wk and two others reduced the size of their ulcers by 2/3 within this period; three failed to heal and underwent surgery. Among the antacid group, eight showed complete healing within three wk, three showed at least a 2/3 reduction in ulcer size, and four required surgery. Of 14 smokers in both groups, healing of the ulcers was achieved in 13. Temporary diarrhea occurred in three antacid and one placebo patient, and only one patient (placebo) complained of pain. Of the seven patients in both groups who required surgery, four were classified as having chronic ulcer disease of three or more months duration and all had relatively large ulcers. It is concluded that in gastric ulcer patients hospitalized for three wk, the rate of healing of the ulcer and the relief of pain are not influenced by treatment with a standard antacid preparation. The rate of healing is not influenced by smoking but does appear to be related to the initial size of the ulcer.

8630 ASPIRIN AND GASTRIC ULCER. *(E.)* Cameron, A. J. (Mayo Clin., Rochester, Minn.). *Mayo Clin. Proc.* 50(10):565-570, 1975.

To determine whether a relation exists between aspirin consumption and gastric ulcer, aspirin intake was studied in 61 patients with roentgenographic and, in some cases, surgical evidence of gastric ulcer and in 17 patients with gastric and duodenal ulcers. A questionnaire and physician interview were used in each case to determine gastrointestinal symptoms and aspirin consumption. Thirty-two of the gastric ulcer patients were regular aspirin users (consuming 15 or more aspirin-containing medications/wk) compared with only six of the 61 control patients. Less frequent aspirin intake was not associated with gastric ulcer. When 21 patients, who took aspirin for abdominal pain or heartburn or in whom the ulcer symptoms began before the start of aspirin usage, were excluded, 18 of the remaining gastric ulcer patients were regular aspirin users compared with only three of their matched controls. Of the 17 patients with both gastric and duodenal ulcers, three were regular users of aspirin while their controls were not; none of the patients who took aspirin regularly used it for ulcer pain. Ulcers associated with regular aspirin use were usually found in the gastric antrum; the incidence of ulcers in this region was significantly higher among regular users than among occasional users or nonusers. Ulcer size was not correlated with aspirin intake. Compared with the occasional users and nonusers, the regular aspirin users were younger and were more often females and nonsmokers. The types of aspirin preparations used by the gastric ulcer patients did not differ from those used by the controls. The findings suggest that aspirin may be a common cause of gastric ulcer in man.

8631 THE EFFECT OF INTRAVENOUS GLUCOSE ON PENTAGASTRIN-INDUCED GASTRIC ACID SECRETION IN MAN. *(E.)* Holst, J. J.; Christiansen, J. (Bispebjerg Hosp., DK-2400, Copenhagen NV, Denmark). *Acta Chir. Scand.* 141(4):289-291, 1975.

The effect of i.v. glucose (50 ml of a 50% glucose solution injected over a 4-min period) on penta-

gastrin (0.5 μg/kg/hr, i.v. for 3 hr)-induced submaximal gastric acid secretion was investigated in six men and two women with uncomplicated duodenal ulcer and normal glucose tolerance. The patients were fasted overnight and [^{51}Cr]-EDTA was instilled *via* a thin tube into the stomach prior to the beginning of pentagastrin infusion; glucose administration was begun after one hr of pentagastrin infusion. The gastric juice was collected at 15-min intervals for three hr by means of intermittent mechanical suction. In all subjects, steady state secretion was reached after 45 min of pentagastrin infusion. The administration of glucose was completely without effect on the acidity or volume of the gastric juice. The glucose assimilation constant (1.27) was within the normal range. The results indicate that glucose *per se* is not responsible for the previously observed inhibition of gastric acid secretion after intrajejunal glucose.

8632 GELFOAM EMBOLIZATION OF THE LEFT GASTRIC ARTERY FOR BLEEDING ULCER. *(E.)* Gold, R. E.; Grace, M. (Univ. Hosp., Univ. Western Ontario, London, Ontario, Canada). *Radiology* 116(3):575-580, 1975.

A technique for nonoperative treatment of gastrointestinal bleeding, which consists of occluding the bleeding vessel with embolic material injected through a catheter, was employed in dogs to determine its reliability and safety. A bleeding gastric ulcer was surgically created in 18 dogs, and the left gastric artery was successfully catheterized by percutaneous techniques in 15 dogs. Vasopressin infusion was used in the treatment of nine of these dogs; it did not arrest the hemorrhage. A total of 11 dogs underwent embolization with strips of Gelfoam (treatment was subsequent to unsuccessful vasopressin therapy in 5); hemorrhage was stopped by this method in 10 dogs. These results indicate that embolization of left gastric artery branches is a practical, simple and effective way to arrest rapid bleeding in the left gastric arterial distribution. The technique proved effective in lesions not treatable by vasopressin infusion. An advantage is that embolization of a bleeding site permits immediate removal of the catheter. The results indicate that the technique is effective in controlling bleeding and does not result in undue hazard. During embolization of the left gastric artery, intercurrent embolization of hepatic and splenic artery branches occurred in several animals but this was not considered to be a significant factor contributing to their death. Injection of excessive volumes of emboli resulted in a high proportion of the emboli lodging in vessels other than the left gastric artery. Other factors contributing to misplaced emboli were: excessively large volumes of initial embolic material; left gastric artery spasm due to trauma from guide wire or catheter; and increased peripheral resistance due to previous vasopressin infusion. Use of this technique is recommended for poor-risk patients not suitable for surgical therapy in whom a trial of vasopressin therapy has been unsuccessful in controlling hemorrhage.

8633 AN EVALUATION OF SEGMENTAL GASTRECTOMY FOR GASTRIC ULCER: ONE TO TEN YEAR FOLLOW-UP. *(E.)* Sekine, T.; Tsukamoto, M.; Sato, T. (Tohoku Univ. Sch. Medicine, Sendai, 980, Japan). *Surgery* 78(4):508-514, 1975.

To determine the clinical value of segmental gastrectomy for gastric ulcer, 26 of 61 patients subjected to the procedure were followed up for periods of one to ten yr. The follow-up study involved questionnaire reviews, personal interviews, gastric X-ray examinations, histamine-augmented gastric secretion analyses, endoscopic examinations, and determinations of gastric emptying time. Neither the dumping syndrome nor gastric retention were encountered in any of the 26 patients studied. X-ray examination revealed a relatively large gastric remnant with no evidence of either abnormal dilatation or stenosis. The pyloric ring and duodenal bulb were well preserved, with peristaltic activity being maintained in the gastric remnant. The average reduction in maximal acid concentration in the gastric juice after segmental gastrectomy was 58.3%, the average reduction in maximal acid output was 67.1%, and the average reduction in peak acid output was 67.6%. In most of the 26 patients, gastric emptying times were more similar to those in 20 normal subjects than to those in 65 patients with Billroth I or II gastrectomies. Endoscopic visualization revealed a rhythmic contraction and slight dilatation of the pyloric ring after segmental gastrectomy. There was no reddening or erosion in the mucosa of the gastric remnant, nor was there any recurrence of ulcer. The results in these patients indicate the value of segmental gastrectomy in the treatment of gastric ulcer and other benign lesions in the midportion of the stomach.

8634 REVERSIBILITY OF PYLORIC SPHINCTER DYSFUNCTION IN GASTRIC ULCER. *(E.)* Fisher, R. S.; Boden, G. (Temple Univ. Health Sci. Center, Broad and Ontario Sts., Philadelphia, Pa. 19140). *Gastroenterology* 69(3):591-597, 1975.

In order to study both the cause and reversibility of pyloric sphincter dysfunction in gastric ulcer patients, pyloric sphincter pressures were measured in ten normal subjects and in 13 of 20 patients (16 men and 4 women, aged 33-68 yr) with active benign gastric ulcer. Manometric measurements were made before and during gastric acidification. In normal subjects the pyloric sphincter pressure increased significantly in response to the intraduodenal instillation of hypertonic amino acids, sodium oleate, and HCl. Gastric ulcer patients, in contrast, exhibited no significant changes. The mean fasting serum gastrin concentration was significantly higher in the group with gastric ulcer, measuring 89.7 pg/ml, compared to 68.5 pg/ml for controls. Prior to gastric acidification, duodenal infusion of amino acids did not influence the basal pressure of the pyloric sphincter. In contrast, 30 min after the initiation of gastric acidification, amino acids increased pyloric pressure from a basal level of 5 to 13 mm Hg. In normal subjects, sodium oleate and amino acids increased pyloric responses to 12.8 mm Hg and

13.5 mm Hg, resp. In contrast, gastric ulcer patients had pyloric pressure responses of only 4.6 and 5.0 mm Hg, resp. However, during gastric acidification for a minimum of 30 min, these same ulcer patients had normal pyloric pressure responses to the same stimuli (measuring 16.0 and 14.5 mm Hg, resp.). In three additional normal subjects, gastric acidification had no effect on the pyloric responses to hypertonic amino acids and sodium oleate. Gastric acidification did not change the serum gastrin concentrations from fasting values. Mean serum gastrin before acidification was 89.7 pg/ml and after, 93.7 pg/ml. The results of these studies confirmed the suggestion that pyloric sphincter dysfunction occurs in patients with gastric ulcer and that these patients have elevated concentrations of serum gastrin. The findings also demonstrate that pyloric sphincter dysfunction can be reversed by gastric acidification in patients with gastric ulcer. This reversal of pyloric dysfunction is not related to any alteration in the concentration of serum gastrin. The mechanism of pyloric dysfunction in patients with gastric ulcer remains unknown.

8635 EFFECT OF GASTRIC SURGERY ON THE GASTROINTESTINAL DRUG ABSORPTION IN MAN. *(E.)* Venho, V. M. K.; Aukee, S.; Jussila, J.; Mattila, M. J. (Dept. Pharmacology, Univ. Helsinki, Siltavuorenpenger 10, SF-00170 Helsinki 17, Finland). *Scand. J. Gastroenterol.* 10(1):43-47, 1975.

The effect of gastric surgery on the absorption of quinidine (0.2 g, p.o.), ethambutol (25 mg/kg, p.o.), and sulphafurazole (1.0 g, p.o.) was studied in 14 men hospitalized for surgical treatment of ulcer disease. The drug absorption tests and a betazole test of basal and maximal acid output (after Histalog administration, 1.5 mg/kg) were performed before and an average of 2.5 months after antrectomy with gastroduodenostomy (ABI, 2 patients), antrectomy with gastroduodenostomy and selective vagotomy (10 patients), selective vagotomy (1 patient), or pyloroplasty (1 patient). Serum drug concentrations were measured 0 to 6 hr after drug administration and the urinary drug concentrations were measured six hr after drug administration. ABI and selective vagotomy lowered the serum levels of all drugs significantly at all time periods; the effect on quinidine and sulphafurazole was more pronounced than that on ethambutol. The urinary excretion of all drugs was also decreased after ABI with vagotomy, but only the decreases in quinidine and sulphafurazole excretion were significant. In three patients retested 10 to 16 mo after the postoperative test, the serum concentrations of all drugs were still significantly lowered compared with preoperative values. The excretion of quinidine and sulphafurazole in the urine was also significantly lowered, but the urinary excretion of ethambutol was increased over preoperative levels. In the patients treated with ABI alone, there were no changes in the serum or urinary drug concentrations postoperatively. In two of three patients with preoperative gastric retention, there was a tendency toward slightly improved absorption after surgery. Basal and maximal acid secretion decreased markedly after ABI with vagotomy and in the patients with preoperative gastric retention; this was associated with an increase in pH. Acid secretion and pH were unchanged after ABI alone. The data indicate that factors other than pH are important in drug absorption. The retarded absorption after ABI with vagotomy can lead to failures in peroral drug treatment in the months immediately following surgery.

8636 GASTRIN, G CELLS, AND GASTRIC ACID IN RATS WITH SECRETAGOGUE-PRODUCED AND ANTI-SECRETAGOGUE-INHIBITED DUODENAL ULCERS [abstract]. *(E.)* Joffe, S. N.; Gaskin, R.; Barros D'Sa, A. A. J.; Polak, M.; Bloom, S. R.; Baron, J. H. (R. Postgrad. Med. Sch., London, England). *Gut* 16(5):407, 1975.

8637 TISSUE GASTRIN IN PEPTIC ULCERATION [abstract]. *(E.)* Connon, J. J.; Ardill, J.; McFarland, R. J. (Belfast City Hosp., Belfast, Ireland). *Gut* 16(5):407, 1975.

8638 THE VALUE OF BRUSH CYTOLOGY IN THE DIAGNOSIS OF GASTRIC CANCER [abstract]. *(E.)* Smithies, A.; Lovell, D.; Hishon, S.; Kellock, T. D.; Misiewicz, J. J.; Newton, C.; Pounder, R. E.; Blendis, L. M. (Central Middlesex Hosp., Park Royal, London, England). *Gut* 16(5):395, 1975.

8639 PYLORIC SPHINCTER PRESSURE (PSP) STUDIES. EFFECT OF CIGARET SMOKING, ATROPINE AND METOCLOPRAMIDE [abstract]. *(E.)* Valenzuela, J. E.; Defilippi, C.; Csendes, A. (Univ. Chile Sch. Med., Santiago, Chile). *Gastroenterology* 68(4):1064, 1975.

8640 GASTRIC ULCERS PRODUCED IN CATS BY PROLONGED INTRAVENOUS INFUSION OF ASPIRIN [abstract]. *(E.)* Bugat, R.; Thompson, M. R.; Grossman, M. I. (VA Wadsworth Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):1057, 1975.

8641 ELECTROCOAGULATION IN UPPER GASTROINTESTINAL HEMORRHAGE: A TWO YEAR EXPERIENCE [abstract]. *(E.)* Papp, J. P. (Blodgett Mem. Hosp., Grand Rapids, Mich.). *Gastroenterology* 68(4):1040, 1975.

8642 EFFECT OF ORAL 16, 16 DIMETHYL PROSTAGLANDIN E_2 (PGE_2) ON MEAL-STIMULATED GASTRIC ACID SECRETION IN DUODENAL ULCER PATIENTS [abstract]. *(E.)* Ippoliti, A.; Walsh, J. H.; Isenberg, J. I. (Wadsworth VA Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):918, 1975.

8643 GASTRIC PROSTAGLANDIN E (PGE) OUTPUT DURING BASAL AND STIMULATED ACID SCRETION IN NORMAL SUBJECTS AND PATIENTS WITH PEPTIC ULCER [abstract]. *(E.)* Cheung, L. Y.; Jubiz, W.; Moore, J. G.; Frailey, J. (Univ. Utah Coll. Med., Salt Lake City). *Gastroenterology* 68(4):873, 1975.

8644 GASTROCOLIC FISTULA COMPLICATING BENIGN ULCER [abstract]. *(E.)* Morton, R. E. (Univ. Miami Sch. Med., Miami, Fla.). *Gastroenterology* 68(4):1038, 1975.

8645 QUALITATIVE COMPARISON OF ENDOSCOPY AND RADIOLOGY IN THE DIAGNOSIS OF DUODENAL ULCER [abstract]. *(E.)* Shirakabe, H.; Nishizawa, M.; Nomoto, K.; Ariyama, J.; Hamilton, G. B. (Dept. Gastroenterol., Juntendo Univ., Tokyo, Japan). *Gastroenterology* 68(4):1031, 1975.

8646 DUODENAL ULCERS PRODUCED BY NONSTEROIDAL ANTIINFLAMMATORY COMPOUNDS PLUS BILE DUCT LIGATION [abstract]. *(E.)* Robert, A.; Nezamis, J. E.; Lancaster, C. (Dep. Exp. Biol., Upjohn Co., Kalamazoo, Mich.). *Gastroenterology* 68(4):973, 1975.

8647 THE ROLE OF GASTRIC INHIBITORY POLYPEPTIDE IN DUODENAL ULCER [abstract]. *(E.)* Cataland, S.; Brooks, R.; Odorisio, T.; Mekhjian, H. S. (Ohio St. Univ. Dep. Med., Columbus, Ohio). *Gastroenterology* 68(4):871, 1975.

8648 PANCREATIC BICARBONATE SECRETION AND SERUM SECRETIN IN RESPONSE TO GRADED AMOUNTS OF DUODENAL ACIDIFICATION IN DUODENAL ULCER AND NORMAL SUBJECTS [abstract]. *(E.)* Cano, R.; Bloom, S. R.; Isenberg, J. I. (Wadsworth VA Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):870, 1975.

8649 EXPERIENCE WITH ESOPHAGOGASTRODUODENOSCOPY IN DIAGNOSIS OF 79 PEDIATRIC PATIENTS WITH HEMATEMESIS, MELENA OR CHRONIC ABDOMINAL PAIN [abstract]. *(E.)* Ament, M. E.; Gans, S. L.; Christie, D. L. (UCLA Medical Sch., Los Angeles, Calif.). *Gastroenterology* 68(4):858, 1975.

8650 ANTI-GASTRIN THERAPY IN PEPTIC ULCER DISEASE [abstract]. *(E.)* Plata, A. A. (Hosp. La Samaritana, Bogota, Colombia). *Gastroenterology* 68(4):858, 1975.

8651 VAGOTOMY AND ORGAN-SPARING IN TREATMENT OF ULCER DISEASE. *(Rus.)* Fuks, B. I.; Perkin, E. M.; Getta, A. I.; Kozlov, V. I.; Varfolomeyev, A. M.; Dyachuk, V. D.; Nishchyi, V. A. (Clinic Surgery, Novokuznetsk Inst. Postgraduate Training Physicians, Municipal Hosp. 1, USSR). *Khirurgiia* (4):32-35, 1974.

8652 CONDITION OF GASTRIC SECRETION IN DUODENAL ULCER IN CHILDREN. *(Rus.)* Belousov, Y. V. (First Dept. Pediatrics, Ukrainian Inst. Postgraduate Training Physicians, USSR). *Radiol. Diagn.* (3):26-29, 1975.

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8656 SPONTANEOUS FORMATION OF A CHOLEDOCHO-GASTRIC FISTULA. *(Ger.)* Bottcher, J.; Horstkotte, W. (Diagnostiches Strahleninstitut des Allgemeinen Krakenhauses St. Georg, Hamburg, Germany). *Leber Magen Darm* 5(1):21-24, 1975.

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8660 FACTORS COMPLICATING OBSERVED ASSOCIATIONS BETWEEN PEPTIC ULCER AND OTHER DISEASES. *(E.)* Donaldson, Jr., R. M. (Dept. Medicine, Veterans Administration Hosp., West Haven, Conn. 06516). *Gastroenterology* 68(6):1608-1614, 1975.

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8663 VAGOTOMY IN THE ELECTIVE TREATMENT OF DUODENAL ULCER. *(E.)* Schrock, T. R. (Dept. Surgery, Univ. California, San Francisco, Calif. 94143). *Gastroenterology* 68(6):1615-1628, 1975.

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8667 PEPTIC ULCER IN CHILDHOOD. *(Sp.)* Martinez Torres, E.; Hdez, A. F.; Valls, O.; Rivera, E. G. (Hospital Infántil docente "Angel A. Aballi," Calzada de Bejucal Km 7½, A. Naranjo, La Habana 19, Cuba). *Rev. Cubana Pediatr.* 47(1):45-55, 1975.

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8674 THE INFLUENCE OF ACUTE HYPERCALCEMIA ON GASTRIC SECRETION IN DUODENAL ULCER, PEPTIC ULCER OF THE JEJUNUM, AND IN ZOLLINGER-ELLISON SYNDROME. *(Ger.)* Arendt, R. (Klinik fur Innere Medizin der Univ., 25 Rostock, Ernst-Heydemann-Strasse, Germany). *Z. Gesamte Inn. Med.* 30(10):349-353, 1975.

8675 THE POSSIBILITY OF DIETARY PROTECTIVE FACTORS IN DUODENAL ULCER. *(Eng.)* Tovey, F. I.; Jayaraj, A. P.; Clark, C. G. (Univ. Coll. Hosp. Medical Sch., London, England). *Postgrad. Med. J.* 51(596):366-372, 1975.

8676 HYPERSECRETION AND LENGTH OF HISTORY IN DUODENAL ULCERATION. *(Eng.)* Hobsley, M.; Whitfield, P. F.; Faber, R. G.; Parkin, J. V. (Middlesex Hosp., London W1N 8AA, England). *Lancet* 2(7925): 101-104, 1975.

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8678 CHILDREN WITH DUODENAL ULCERS AND THEIR FAMILIES. *(Eng.)* Puri, P.; Boyd, E. (Our Lady's Hosp. for Sick Children, Crumlin, Dublin, Eire). *Arch. Dis. Child.* 50(6):485-486, 1975.

8679 BIOLOGICAL ACTIVITY AND CLEARANCE OF HUMAN BIG GASTRIN IN MAN [abstract]. *(Eng.)* Walsh, J. H.; Maxwell, V.; Isenberg, J. I. (UCLA Med. Sch., Los Angeles, Calif.). *Clin. Res.* 23(3):259A, 1975.

8680 PERFORATED PEPTIC ULCER: ANALYSIS OF 100 CONSECUTIVE CASES. *(Por.)* Martins, A.; Quaglia, S.; Godoy, A. C.; Sugahara, M.; Goffi, F. S. (Hospital Servidor Publico Estado, Sao Paulo, Brazil). *An. Paul. Med. Cir.* 102(4):147-152, 1975.

See also, 8134, 8152, 8166, 8197, 8452, 8464, 8472, 8528, 8537, 8550, 8558, 8560, 8563, 8578, 8586, 8588, 8601, 8608, 8611, 8612, 8621, 8689, 8705, 8718, 8871, 8999, 9013, 9318, 9330, 9338.

8681 AN INTESTINAL DISEASE PRODUCED EXPERIMENTALLY BY A PROSTAGLANDIN DEFICIENCY. *(E.)* Robert, A. (Dept. Experimental Biology, Upjohn Co., Kalamazoo, Mich. 49001). *Gastroenterology* 69(4): 1045-1047, 1975.

To determine whether the severe intestinal syndrome produced in rats by certain nonsteroidal anti-inflammatory compounds is due to the prostaglandin deficiency elicited by these agents, prostaglandins were administered (p.o. or s.c. twice daily for three days, once p.o., or by constant s.c. infusion) to female Upjohn rats treated with a single p.o. dose of indomethacin (10 mg/kg in the fed rats and 20 mg/kg in the fasted rats). All prostaglandins tested inhibited the formation of intestinal lesions caused by indomethacin, the degree of protection being dose-dependent. The A and E type prostaglandins were the most potent in this respect, and a dimethyl group at C-16 increased the activity of prostaglandin E_2 and prostaglandin $F_{2\alpha}$, while derivative formation, as in the 15-acetate and 15-methyl ester of prostaglandin A_2, greatly decreased activity. Several prostaglandins, notably prostaglandin E_2, were more active p.o. than s.c. When given as a single p.o. dose, 16,16-dimethyl prostaglandin E_2 offered complete protection when given 30 min after indomethacin and nearly complete protection when given 30 min before, with, and one hr after indomethacin. The incidence of lesions rose when the prostaglandin was given more than one hr after indomethacin, reaching near maximum when given four hr later. However, the severity of the lesions was greatly reduced when the prostaglandin was administered up to six hr after indomethacin. When prostaglandin was given 24 hr after indomethacin, the incidence of adhesions was roughly the same as in controls treated with indomethacin alone. Prostaglandin treatment appears to prevent the intestinal syndrome caused by the nonsteroidal anti-inflammatory compounds by preventing the prostaglandin deficiency produced by these agents.

8682 THE RATE OF WEIGHT LOSS AFTER INTESTINAL BYPASS OPERATIONS FOR OBESITY. AN ANALYSIS OF FACTORS OF SIGNIFICANCE. *(E.)* Backman, L. (Dept. Surgery, Karolinska Sjukhuset, Stockholm, Sweden). *Acta Chir. Scand.* 141(5):424-430, 1975.

Relations between the rate and amount of weight loss were studied in 61 women and 19 men following intestinal bypass operations for obesity. End-to-side jejuno-ileostomies were performed in 19 patients, and end-to-end jejuno-ileostomies with ileocecostomies were performed in the remaining 61. Determinations were made of body height, weight, surface area, weight-index, small intestinal length, and the rate of weight loss (b-value). The postoperative period was subdivided into five periods: during period I, the patients lost weight rapidly; period II was characterized by a linear course; the curve leveled off during period III; weight increased during period IV; and weight stabilized in period V. Period II was characterized by a b-value of 0.011 weight-index units or 0.79 kg/week; the mean duration of this period was 44.3 weeks and the total weight loss in the whole series was 0.74 weight-index units or 50.7 kg. Although the end-to-end procedure was followed by a slightly higher b-value than the end-to-side procedure, the difference was not significant. Significant correlations were found between body weight and b-value after both procedures and between b-value and the length of the distal ileum (both absolute length and length compared with that of the total small intestinal length) after the end-to-end procedure; there was no correlation between b-value and length of the distal ileum after the end-to-side procedure. Total weight loss in periods I to III was positively and significantly correlated with the b-value after the end-to-side procedure. The length of the jejunal segment in function was probably not a determining factor in the weight loss when a 30 to 60 cm jejunal segment was used. The authors suggest that the functional capacity of certain segments of a long small intestine might be inferior to that of a shorter segment. In addition, it is suggested that a small intestinal bypass operation be performed not as a standardized procedure with predetermined segments of the small intestine in function, but rather as an operation tailored for each patient.

8683 NON SPECIFIC DUODENITIS. A STUDY OF 80 CASES. *(Fr.)* Chaput, J. C.; Petite, J. P.; Rain, B.; Buffet, C.; Camillieri, J. P.; Etienne, J. P. (Service d'Hepatologie et de Gastroenterologie Hopital Antoine-Beclere, 157, rue de la Porte-de-Trivaux, Clarmart, France). *Arch. Fr. Mal. App. Dig.* 63(8):611-623, 1974.

Nonspecific duodenitis was studied in 80 patients by the use of endoscopic observation and directed biopsy (duodenal and gastric x-rays as well as gastric acid secretions). Of the patient pool, 86.2% were males; a control population of 16 patients suffering from a growing bulbous ulcer was set up. The use of biopsy was stressed since in some histologically-proven duodenitis no clinical, endoscopic or radiographic abnormality indicated such diagnosis. Subdivisions were made as follows: (1) normal duodenum, (2) simple erythematic duodenitis (without fold modification), (3) erythematic duodenitis with generous folds, and (4) erosive duodenitis. Discordances arose when histologically normal duodenums were found in patients with endoscopic abnormalities, suggesting that histological lesions may be located in "regions," or suggesting vascular congestion without histological inflammation. The gastric acid level was higher in histologically observed duodenitis as opposed to normal endoscopic observation. Alcoholism seemed to correlate positively with endoscopically proven duodenitis. Duodenitis is likely to surround an evolutive ulcer, but it is not known whether duodenitis is the only anatomical substrate on which an ulcer may develop.

8684 ISCHAEMIC NECROSIS OF THE SMALL BOWEL IN A CASE OF MALIGNANT HYPERTENSION. *(E.)* Corbett, R. H. (Western Infirmary, Glasgow G11 6NT, Scotland). *Br. J. Radiol.* 48(574):860-862, 1975.

A case report of a 20-yr-old man with radiologically demonstrable changes in the small bowel, ischemic necrosis of the small intestine and malignant hypertension is discussed. The patient presented with acute abdominal pain, steadily deteriorating vision in both eyes, and a supine blood pressure of 260/160. Barium examination showed a markedly abnormal terminal ileum (30 cm in length) with loss of fold pattern in a dilated segment and with widespread ulceration and narrowing in the adjacent loop. Pathological examination confirmed the extensive ulceration; mucosal edema suggested the absence of any mucosal fold pattern. Both plasmatic vasculosis and acute vasculitis with abundant polymorphs were present in the submucosal vessels. Resection of the terminal ileum was followed by a steady improvement in vision and blood pressure. The cause of the malignant hypertension involving the intestine could not be determined. Arteriography revealed two right renal arteries but no obvious renal artery stenosis, nor was stenosis seen at laparotomy. Divided renal function studies and angiotensin II estimations were normal. There was no evidence of a collagen disease, microangiopathic hemolytic anemia, or a pheochromocytoma. Fibrinoid degradation products were normal. This is the second case of abdominal pain and malignant hypertension occurring in a young patient. It is suggested that such patients undergo a barium meal and follow-through examination to exclude a vascular origin for the abdominal pain.

8685 STUDIES ON SMALL INTESTINAL OBSTRUCTION. I. INTRALUMINAL PRESSURE IN EXPERIMENTAL LOW SMALL BOWEL OBSTRUCTION IN THE CAT. *(E.)* Ohman, U. (Dept. Surgery, Karolinska Sjukhuset, Stockholm, Sweden). *Acta Chir. Scand.* 141(5):413-416, 1975.

The type and magnitude of intraintestinal pressure was recorded with open-tip catheters in cats with small intestine obstruction induced by ligation of the terminal ileum. Resting pressure before obstruction was 2 to 4 mm Hg. After obstruction of 72 hr duration, sustained intraluminal pressure ranged from 5 to 10 mm Hg. Long periods of inactivity alternated with short bouts of spontaneous intestinal activity. Both type I and type III waves were recorded during this activity, and the pressure rose to about 20 mm Hg. Activity that was principally type III was elicited by cholecystokinin (2 Ivy dog U/kg). In motility responses induced by this agent, pressure waves rose momentarily to values in the 40 to 50 mm Hg range. Considerable intestinal distention was the principal finding upon opening the abdominal cavity; there were no macroscopic signs of nonviability of the intestinal wall. Although the magnitude of the sustained luminal pressure induced by small intestine obstruction is rather modest, the combined mechanisms of distension and raised intraluminal pressure may have a detrimental effect on the mucosal microcirculation.

8686 STUDIES ON SMALL INTESTINAL OBSTRUCTION. II. BLOOD FLOW, VASCULAR RESISTANCE, CAPILLARY FILTRATION, AND OXYGEN CONSUMPTION IN DENERVATED SMALL BOWEL AFTER OBSTRUCTION. *(E.)* Ohman, U. (Dept. Surgery, Karolinska Sjukhuset, Stockholm, Sweden). *Acta Chir. Scand.* 141(5):417-423, 1975.

To assess the viability of the feline small intestine after 72 hr of simple obstruction (*via* umbilical tape tied around the terminal ileum), capillary filtration and oxygen consumption were determined during *in vitro* homologous perfusion of the intestine 30 min after release of the obstruction. After homologous perfusion and relief of the obstruction, the intestinal specimen was transferred to an organ chamber. During the course of obstruction, the animals lost weight (mean, 7.5%); the small intestines were considerably distended and presented the classical appearance of simple bowel obstruction. No macroscopic signs of nonviability were observed. During the perfusion procedure, the host animals provided mean arterial pressures of about 100 mm Hg. The resulting mean flow rates were 45 to 50 ml/min/100 g, and the vascular resistance averaged about 2.5 PRU. Capillary filtration showed a mean of about 0.1 and the mean oxygen consumption was about 3 ml/min/100 g. The obstructed intestines did not differ significantly from nonobstructed control intestines in any of these parameters. The results indicate that the alleged microcirculatory impairment caused by an experimental, low, small intestine obstruction is rapidly ameliorated following decompression of the bowel. Thus, the bowel microvasculature appears to have a considerable functional reserve.

8687 ADHERENCE OF ENTEROPATHOGENIC Escherichia coli TO INTESTINAL EPITHELIUM IN VIVO. *(Eng.)* Hohmann, A.; Wilson, M. R. (Ontario Veterinary Coll., Univ. Guelph, Ontario, Canada). *Infect. Immun.* 12(4):866-880, 1975.

Two porcine stains of enteropathogenic *Escherichia coli*, one possessing K88 antigen (strain P155) and one lacking K88 (strain 340), were compared with respect to their ability to proliferate in the small intestine and to adhere to the intestinal epithelial surface *in vivo*. Twelve piglets were infected p.o. with 1 ml of saline suspension containing 10^{10} bacteria at about four hr postpartum. The animals were killed at 12, 13, or 14 hr postinfection and bacteriological cultures were made from rectal swabs, spleen, and liver. The small intestine was examined by scanning and transmission electron microscopy, and bacterial counts were obtained from the walls of normal and infected intestines. Although both strains of *E. coli* caused severe diarrhea, only the K88-possessing strain was able to proliferate in the anterior small intestine. Both strains proliferated equally well in the posterior segments of the small intestine, and with both strains, significantly greater numbers of organisms were recovered from the homogenized intestinal wall than were recovered from the luminal contents. Transmission and scanning electron microscopy revealed large numbers of bacteria adhering to the epithelial surface in the posterior intestinal region. Although electron microscopy did not reveal the adhesive mechanism of either strain of *E. coli*, shadow-cast prepara-

tions demonstrated an unusual appendage on the cells of strain 340. These appendages appeared as 1 to 6 μm-long strands which were 80 to 100 nm wide at the base and became thinner at their extremities; these strands were usually branched. The number of *E. coli* recovered from the duodenums of pigs infected with strain 340 did not significantly exceed that from noninfected controls. The data cast doubt on the necessity for proliferation of *E. coli* in the anterior small intestine as an essential step in the pathogenesis of porcine enteric colibacillosis.

8688 EFFECT OF FOOD INTAKE AND THE PITUITARY ON INTESTINAL STRUCTURE AND FUNCTION AFTER SMALL BOWEL RESECTION IN THE RAT [abstract]. *(E.)* Taylor, B.; Murphy, G. M.; Dowling, R. H. (Guy's Hosp., London, England). *Gut* 16(5):397-398, 1975.

8689 THE PATHOPHYSIOLOGY OF DUODENITIS [abstract]. *(E.)* Donovan, I. A.; Green, G.; Dykes, P. W.; Owens, C.; Glendinnen, B. G.; Alexander-Williams, J. (Gen. Hosp., Birmingham, England). *Gut* 16(5):395, 1975.

8690 PATCHINESS OF THE MUCOSAL ABNORMALITY IN COELIAC DISEASE (CD) AND DERMATITIS HERPETIFORMIS (DH) [abstract]. *(E.)* Scott, B. B.; Losowsky, M. S. (St. James's Hosp., Leeds, England). *Gut* 16(5):393, 1975.

8691 JEJUNAL COLONIZATION WITH ENTEROBACTERIA IN SYMPTOMATIC TROPICAL RESIDENTS WITHOUT ACUTE SPRUE [abstract]. *(E.)* Tomkins, A. M.; Wright, S.; James, W. P. T.; Drasar, B. S. (London Sch. Hygiene and Tropical Med., London, England). *Gut* 16 (5):392, 1975.

8692 LITHOGENIC AND HEPATOTOXIC POTENTIAL IN INTESTINAL BY-PASS: BILE ACID AND STEROL CHANGES [abstract]. *(E.)* Faloon, W. W.; Bubulis, A.; Flood, M. S. (Highland Hosp., Rochester, N.Y.). *Gastroenterology* 68(4):1073, 1975.

8693 PROTEIN DIGESTION AND ABSORPTION AFTER SMALL BOWEL RESECTION [abstract]. *(E.)* Curtis, K. J.; Kim, Y. S. (VA Hosp., San Francisco, Calif.). *Gastroenterology* 68(4):1071, 1975.

8694 DOUBLE BLIND EVALUATION OF 2 HYPOTONIC DRUGS FOR DUODENOSCOPY AND DUODENOGRAPHY [abstract]. *(E.)* Bertrand, G.; Woods, R. E.; Raheja, K. L.; Linscheer, W. G. (VA Hosp., Syracuse, N.Y.). *Gastroenterology* 68(4):1069, 1975.

8695 HAMARTOMA OF BRUNNER'S GLAND: ENDOSCOPIC DIAGNOSIS [abstract]. *(E.)* Rider, J. A.; Puletti, E. J.; Rider, R. D.; Harnchonboth, K. (Ralph K. Davies Med. Cent. Franklin Hosp., San Francisco, Calif.). *Gastroenterology* 68(4):1043, 1975.

8696 DUODENITIS, ENDOSCOPIC AND HISTOPATHOLOGICAL CORRELATION [abstract]. *(E.)* Ramierz-Degollado, J.; Garcia, J. A. (Gen. Hosp., National Medical Center, IMMS., Mexico). *Gastroenterology* 68(4):1042, 1975.

8697 EFFECT OF SMALL AMOUNTS OF ANTACIDS ON CALCIUM, PHOSPHORUS, AND FLUORIDE METABOLISM IN MAN [abstract]. *(E.)* Spencer, H.; Norris, C.; Coffey, J.; Wiatrowski, E. (VA Hosp., Hines, Ill.). *Gastroenterology* 68(4):990, 1975.

8698 INFLUENCE OF PITUITARY HORMONES ON INTESTINAL STRUCTURE AND FUNCTION AFTER SMALL BOWEL RESECTION IN THE RAT [abstract]. *(E.)* Taylor, B.; Murphy, G. M.; Dowling, R. H. (Guy's Hosp., London, England). *Gastroenterology* 68(4):887, 1975.

8699 INTESTINAL SECRETION IN ACUTE ENTERITIS. A FUNCTION OF CRYPT-TYPE ENTEROCYTES [abstract]. *(E.)* Kerzner, B.; McClung, J.; Kelly, M.; Butler, D.; Gall, G.; Hamilton, R. (Hosp. for Sick Children, Toronto, Ontario, Canada). *Gastroenterology* 68(4):909, 1975.

8700 FREE AMINO ACID AND DIPEPTIDE ABSORPTION IN THE JEJUNUM OF PATIENTS WITH JEJUNOILEAL BYPASS FOR OBESITY [abstract]. *(E.)* Fogel, M. R.; Ravitch, M. M.; Adibi, S. A. (Montefiore Hosp., Pittsburgh, Pa.). *Gastroenterology* 68(4):894, 1975.

8701 AMPULLARY CARCINOMA [abstract]. *(E.)* Norton, R. A.; Paul, R. E.; Miller, H. H.; Kaplan, M. M. (Tufts-New Engl. Med. Cent., Boston, Mass.). *Gastroenterology* 68(4):1039, 1975.

8702 THE FUNCTION OF ANTIBODY IN LOCAL IMMUNITY IN THE SMALL BOWEL. *(E.)* Burrows, W. (Dept. Microbiology, Univ. Chicago, Chicago, Ill., 60637). *Immunochemistry* 12(6/7):621-623, 1975.

8703 THE PATHOGENESIS OF INTESTINAL ATRESIA. *(E.)* Guttman, F. M.; Bensoussan, A. L.; Blanchard, H.; Desjardins, J. G.; Collin, P. P. (Sainte-Justine Hosp. for Children, Montreal, Canada). *Surg. Gynecol. Obstet.* 141(2):203-206, 1975.

8704 ADENOCARCINOMA OF THE JEJUNUM IN AN 18-YEAR-OLD PATIENT: A CASE REPORT. *(E.)* Voegele, L. D.; Moncrief, J. A. (Medical Univ. South Carolina, 80 Barret St., Charleston, S. C. 29401). *Surgery* 78(2):251-253, 1975.

8705 ACUTE POSTOPERATIVE WOUND COMPLICATIONS AFTER GASTRIC SURGERY FOR MORBID OBESITY. *(E.)* Printen, K. J.; Paulk, S. C.; Mason, E. E. (Univ. Hosp., Iowa City, Iowa 52242). *Am. Surg.* 41(8):483-485, 1975.

8706 COMPLICATIONS OF JEJUNOILEAL BYPASS FOR MORBID OBESITY. *(E.)* Jewell, W. R.; Hermreck, A. S.; Hardin, C. A. (Univ. Kansas Medical Center, Rainbow Blvd. at 39th St., Kansas City, Kans. 66103). *Arch. Surg.* 110(8):1039-1042, 1975.

8707 REDUCTION IN VOLUME, ELECTROLYTES, PANCREATIC ENZYMES AND BILE SALTS IN ILEAL FISTULA DRAINAGE DURING INGESTION OF AN ELEMENTAL DIET. *(E.)* Hill, G. L.; Mair, W. S. J.; Edwards, J. P.; Goligher, J. C. (Univ. Dept. Surg., General Infirmary, Leeds, England). *Fed. Proc.* 34(3):931, 1975.

8708 INVESTIGATION OF FOLATE POLYGLUTAMATE HYDROLYSIS IN MAN: COMPARISON OF PROXIMAL SMALL INTESTINAL CONTENTS WITH MUCOSAL HOMOGENATES [abstract]. *(E.)* Graham, D. Y.; Godwin, H. A. (Baylor Coll. Med., Houston, Texas). *Clin. Res.* 23(3):249A, 1975.

8709 RETROGRADE VENOUS DELIVERY OF STEROIDS FOR LYOSOMAL STABILIZATION IN ISCHEMIC BOWEL DISEASE [abstract]. *(E.)* Katz, S.; Williams, L. F. (Boston Univ. Sch. Med., Boston, Mass.). *Clin. Res.* 23(3):252A, 1975.

8710 GLUTEN-SENSITIVE ENTEROPATHY: CORRELATION OF ORGAN CULTURE BEHAVIOR WITH HL-A STATUS [abstract]. *(E.)* Nelson, D. L.; Falchuk, Z. M.; Kasarda, D.; Strober, W. (Natl. Inst. of Health, Bethesda, Md.). *Clin. Res.* 23(3):254A, 1975.

8711 ENTERIC INFECTION WITH COXSACKIEVIRUS B5 DECREASES INTESTINAL EPITHELIAL CELL MIGRATION RATE [abstract]. *(E.)* Broitman, S. A.; Loria, R. M.; Kibrick, S. (Boston Univ. Sch. Med., Boston, Mass.). *Clin. Res.* 23(3):256A, 1975.

8712 CONTRIBUTION TO THE QUESTION OF DUODENOBILIARY REFLUX OF CONTRAST SUBSTANCE DURING ROUTINE GASTRODUODENAL EXAMINATION. *(Cz.)* Vitovec, J. (Regional Public Health Inst., Karlovy Vary, Czechoslovakia). *Cs. Radiol.* 29(2):126-130, 1975.

8713 AN AUTOPSY CASE OF PRIMARY LEIOMYOSARCOMA OF THE DUODENUM WITH A STATISTICAL REVIEW OF A LARGE SERIES OF JAPANESE AUTOPSY CASES: *(Jpn.)* Tanimura, A.; Yamamoto, H.; Yamaguchi, T.; Shibata, H.; Nakashima, T.; Urabe, K. (Kurume Univ. Sch. Medicine, Kurume, Japan). *Gan No Rinsho* 21(3):214-219, 1975.

8714 RADIOLOGICAL FINDINGS IN CASE OF HAEMORRHAGES FROM THE SMALL INTESTINE. *(Ger.)* Dombrowski, H. (Rontgenabteilung der Medizinischen Universitatsklinik Marburg, Marburg, Germany). *Diagnostik* 8(2):51-54, 1975.

8715 SARCOMA OF THE ILEUM. *(It.)* Signorelli, I. (Ospedale Maggiore, Bergamo, Italy). *Chir. Gastroenterol.* 8(4):408-425, 1975.

8716 THE INTRAMURAL HAEMATOMA OF THE SMALL GUT. A RARE COMPLICATION OF ANTICOAGULANT THERAPY. *(Fr.)* Van Cauter, J.; Quintard, N.; Daubresse, J. C.; Docquier, P.; Meunier, R. (Hopital Civil, Charleroi, Belgium). *Acta Gastroenterol. Belg.* 37(10-11):503-507, 1974.

8717 MODERN ASPECTS OF THE PROBLEM OF GASTRODUODENAL HAEMORRHAGES. *(Rus.)* Babichev, S. I.; Briskin, B. S. (Clinic of Surgery, N. A. Semashko Moscow Medical Inst. of Stomatology, Moscow, USSR). *Khirurgiia (Mosk.)* (5):114-121, 1975.

8718 RECONSTRUCTIVE OPERATIONS FOR POSTGASTRECTOMY SYNDROMES. *(Rus.)* Chistova, M. A.; Chistov, L. V. (N. N. Burdenko Faculty Clinic of Surgery, I. M. Sechenov First Moscow Medical Inst., Moscow, USSR). *Khirurgiia (Mosk.)* (5):131-137, 1975.

8719 A NEW MODIFICATION OF OPERATION FOR ALIMENTATIVE JEJUNOSTOMY. *(Pol.)* Jezioro, Z.; Bernat, M.; Zimmer, Z. (Z. Kliniki Chirurgii Przewodu Pokarmowego Instytutu Chirurgii AM we Wroclawiu, Poland). *Pol. Przegl. Chir.* 47(4):517-520, 1975.

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8722 INTESTINAL BYPASS IN THE SURGICAL TREATMENT OF MORBID OBESITY. *(It.)* Doldi, B. S.; Donati, L.; Germiniani, R.; Klinger, R.; Annoni, F.; Mori, G.; Montorsi, W. (Inst. Semeiot. Surg., Univ. Milan, Italy). *Terapia* 59(430):187-199, 1974.

8723 ULCERATED ILEAL DUPLICATION AS AN UNUSUAL CAUSE OF INTESTINAL BLEEDING IN ADULTS. *(Ger.)* Ammann, J.; Scharli, A.; Vogt, B. (Kantonsspital Luzern, CH-6000 Luzern, Switzerland). *Chirurg* 46:76-78, 1975.

8724 LYMPHOMA AS A CAUSE OF INTESTINAL INTUSSUSCEPTION. *(Sp.)* Garcia Aroca, J.; Ollero Caprani, J. M. (Hospital Nino Jesus, Madrid, Spain). *Acta Pediatr. Esp.* 33(387):107-110, 1975.

8725 INTESTINAL INTUSSUSCEPTION IN CHILDHOOD. *(Sp.)* Garrido-Lestache Cabrera, J.; Rollan Villamarin, V.; Garcia Aroca, J. (Hospital Nino Jesus, Madrid, Spain). *Acta Pediatr. Esp.* 33(387): 85-106, 1975.

8726 INTESTINAL INTUSSUSCEPTION AND MECKEL'S DIVERTICULUM. *(Sp.)* Rollan Villamarin, V.; Garcia Aroca, J. (Hospital Nino Jesus, Madrid, Spain). *Acta Pediatr. Esp.* 33(388):117-124, 1975.

8727 STUDIES ON THE PATHOGENESIS OF DIARRHEA FOLLOWING SMALL BOWEL BYPASS FOR MASSIVE OBESITY [abstract]. *(Eng.)* Stein, T.; Wise, L. (Washington Univ. Sch. Med., St. Louis, Mo.). *Clin. Res.* 23(3):257A, 1975.

8728 PATHOGENESIS OF ARTHRITIS ASSOCIATED WITH INTESTINAL BYPASS PROCEDURE FOR MORBID OBESITY: COMPLEMENT ACTIVATION AND CHARACTERIZATION OF CIRCULATING IMMUNE COMPLEXES [abstract]. *(Eng.)* Wands, J. R.; LaMont, J. T.; Mann, E.; Isselbacher, K. J. (Massachusetts Gen. Hosp., Boston, Mass.). *Clin. Res.* 23(3):259A, 1975.

8729 INTESTINAL INTUSSUSCEPTION IN CHILDHOOD RESULTING FROM HODGKIN'S DISEASE LOCALIZED IN THE ABDOMEN. *(Sp.)* Castillo Bernabeu, R.; Bocanegra Carranza, A. (Hopital Nino Jesus, Madrid, Spain). *Acta Pediatr. Esp.* 33(388):131-134, 1975.

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8732 FAILURE OF SECRETION AND CHOLECYSTOKININ (CCK) TO ALTER ILEAL HYPERPLASMA AFTER JEJUNECTOMY IN THE RAT [abstract]. *(Eng.)* Custer, G.; Tawil, T.; Weser, E. (Univ. Texas Health Sci Cent., San Antonio, Tex.). *Clin. Res.* 23(3):248A, 1975.

8733 MECKEL'S DIVERTICULUM. *(Dan.)* Fenger, C.; Bone, J. (Arhus Kommune Hospital, Denmark). *Ugeskr. Laeger* 137(2):82-85, 1975.

8734 STUDIES OF HUMAN FOLATE CONJUGASE [abstract]. *(Eng.)* Halsted, C. H.; Reisenauer, A. M.; Corcino, J. J. (Dept. Med., Univ. California, Davis, Calif.). *Clin. Res.* 23(3):250A, 1975.

8735 INTESTINAL ABSORPTION AND METABOLISM OF D-MANNITOL-U-^{14}C(M-^{14}C) [abstract]. *(Eng.)* Biork, J. T.; Soercel, K. H.; Wood, C. M. (Med. Coll. of Wisconsin, Milwaukee, Wis.). *Clin. Res.* 23(3): 391A, 1975.

8736 COLONIC PSEUDO OBSTRUCTION: A NEW COMPLICATION OF JEJUNOILEAL BYPASS [abstract]. *(Eng.)* Barry, R. E.; Benfield, J. R.; Bray, G. A. (Harbor Gen. Hosp., Torrance, Calif.). *Clin. Res.* 23(3):391A, 1975.

8737 DUODENAL TRAUMA. *(Por.)* Matos, D.; Chacon, J. P.; de Oliveira, E. (Escola Paulista Medicina, Sao Paulo, Brazil). *An. Paul. Med. Cir.* 102(21):153-163, 1975.

8738 THE TREATMENT OF EXTERNAL POSTOPERATIVE FISTULAS OF THE SMALL INTESTINE. *(Fr.)* Francillon, J.; Pasquier, P.; Tissot, E.; Baudet, B.; Vignal, J. (Hopital Edouard-Herriot, 69374 Lyon Cedex 2, France). *Lyon Chir.* 71(4):221-224, 1975.

8739 THREE CASES OF INTESTINAL BEHCET AT TERMINAL ILEUM. *(Jpn.)* Sarashina, H.; Higuchi, M.; Yamazaki, T.; Majima, Y.; Furuyama, N.; Kitsukawa, Y.; Chikenji, Y.; Okui, K.; Kariya, A.; Nagao, K. (Med. Sch., Chiba Univ., Japan). *Rinsho Hoshansen* 20(3):255-261, 1975.

See also, 8017, 8055, 8103, 8433, 8442, 8449, 8488, 8499, 8537, 8549, 8557, 8561, 8589, 8593, 8600, 8606, 8612, 8619, 8740, 8741, 8742, 8749, 8750, 8762, 8778, 8781, 8787, 8800, 8835, 8839, 8848, 8851, 8852, 8859, 8972, 9008, 9012, 9252, 9266, 9269, 9309, 9315, 9319, 9330, 9334, 9345, 9359, 9383, 9397, 9406.

SMALL INTESTINE

Malabsorption

8740 CARNOSINASE ACTIVITY OF HUMAN GASTROINTESTINAL MUCOSA. *(E.)* Sadikali, F.; Darwish, R.; Watson, W. C. (Victoria Hosp., London, Ontario, Canada). *Gut* 16(8):585-589, 1975.

Carnosinase was assayed in endoscopically normal gastric, duodenal, and colonic mucosa from patients with symptoms not related to small intestine function; in jejunal mucosa from patients being investi-

gated for a variety of gastrointestinal disorders (mainly diarrhea or malabsorption); and in the rat jejunal mucosa. The role of this dipeptidase in the absorption of L-carnosine was investigated by comparing tolerance curves for carnosine (β-alanine L-histidine) and its constituent amino acids in 2 patients, one of whom had a markedly reduced activity of jejunal carnosinase. The hydrolysis of carnosine followed the kinetics of a zero order reaction and the rate was proportional to the volume of homogenate in the reaction mixture. The optimum pH was around 8.0. Carnosinase activity was increased about 70% by adding 0.001 M Mn^{++} and was completely inhibited by 0.001 M cyanide. Carnosinase activity in the rat jejunal mucosa was somewhat lower than that in the human jejunum. Little or no enzyme activity was detected in the human gastric and colonic biopsies, and the activity in the human duodenum was considerably lower than in the jejunum. The mean carnosinase activity was 8.8 U in patients with histologically normal jejunal mucosa and 5.7 U in those with partial or subtotal villous atrophy; in the latter patients, the enzyme deficiency was nonspecific and secondary to the villous atrophy. In the second experiment, the rise in serum β-alanine at 30 min and the rise in serum histidine at 30 and 45 min were greater with the mixture of free amino acids than with carnosine in the patient with normal jejunal carnosinase activity. Absorption of both amino acids at 30 and 45 min was somewhat slower in the patient with reduced jejunal carnosinase, but histidine absorption was faster with carnosine than with the free amino acids in this patient. It is concluded that the intestinal mucosa has much less hydrolase activity for carnosine than for glycylglycine and other dipeptidases, and the relatively slow hydrolysis appears to be the rate-limiting step in the total absorptive process.

8741 THE CELLULAR INFILTRATE OF THE JEJUNUM IN ADULT COELIAC DISEASE AND DERMATITIS HERPETIFORMIS FOLLOWING THE REINTRODUCTION OF DIETARY GLUTEN. *(E.)* Lancaster-Smith, M.; Kumar, P. J.; Dawson, A. M. (St. Bartholomew's Hosp., London, England). *Gut* 16(9):683-688, 1975.

The cellular infiltrate of the jejunal mucosa in treated and untreated dermatitis herpetiformis was studied. Jejunal biopsies were obtained from eight control subjects, patients (12) with untreated and treated (using a gluten-free diet, 11 patients) adult celiac disease, and patients (8) with untreated and treated (using a gluten-free diet, 9 patients) dermatitis herpetiformis. In addition, serial jejunal biopsies were obtained from 12 adult celiac disease patients and 12 dermatitis herpetiformis patients while on gluten-free and gluten-containing (10-60 g/day) diets and after a single 25-g gluten challenge. The number of plasma cells in the jejunal biopsy specimens was similar in the patients with adult celiac disease and dermatitis herpetiformis. Compared with the untreated patients, the plasma cell number was reduced in the treated patients; however, the number of plasma cells was significantly greater in both treated and untreated patients than in the controls. The plasma cell counts increased after seven days on a gluten-containing diet compared with pregluten levels and also increased 24 to 48 hr after a single 25-g gluten challenge. The lamina propria lymphocyte count was similar in treated and untreated patients with both diseases and was not significantly different from control values. Although there was no change after seven days on a gluten-containing diet, the number of cells increased significantly, while remaining within normal values after a single 25-g gluten challenge. The number of eosinophils was significantly greater in the untreated patients than in the treated patients or controls; the number in the treated patients and controls was similar. The number of eosinophils increased after a seven-day gluten-containing diet and after a single gluten challenge. Neutrophils were found in small number and only in the diseased patients; their number tended to be greatest in the untreated patients following gluten challenge. The number of intraepithelial lymphocytes was significantly greater in the untreated patients than in the treated patients and was significantly greater in the treated patients than in the controls. The number increased after seven days on a gluten-containing diet and after a single gluten challenge. The results support the view that more than one immunological mechanism may be responsible for the pathogenesis of the jejunal lesion in celiac disease and dermatitis herpetiformis.

8742 ADAPTIVE CHANGES IN VITAMIN B_{12} ABSORPTION IN CELIAC DISEASE AND AFTER PROXIMAL SMALL-BOWEL RESECTION IN MAN. *(E.)* Mackinnon, A. M.; Short, M. D.; Elias, E.; Dowling, R. H. (Royal Postgraduate Medical Sch., Hammersmith Hosp., Ducane Rd., London, England). *Am. J. Dig. Dis.* 20(9):835-840, 1975.

To study possible adaptive changes in ileal vitamin B_{12} absorption following jejunectomy in man, intrinsic-factor-bound vitamin B_{12} (IF-B_{12}) absorption was compared in four patients in whom the proximal small intestine had been resected and in nine patients with adult celiac disease. Twenty-four healthy adults served as controls. The subjects were given a 5-μg dose of ^{58}Co cyanocobalamin and two capsules of human intrinsic factor; ten min and seven days later, vitamin B_{12} absorption was measured by a whole body counting technique with an uncollimated gamma camera. In the control subjects, the mean value for the whole body retention of ^{58}Co cyanocobalamin (at seven days) was 20.4% of the administered dose. In the four patients with extensive jejunal resection, vitamin B_{12} absorption (mean, 42.3%) was significantly greater than in the control subjects. In one patient studied before and after resection, vitamin B_{12} absorption increased more than 150% five months after jejunectomy. The vitamin B_{12} retention values were within normal limits in seven of the nine celiac disease patients; the remaining two cases had retention values of 44.1% and 54.0% of the administered dose, resp. The results suggest that functional ileal adaptation occurs in man after jejunal resection; the pattern of adaptation is similar to that observed in experimental animals.

8743 RETICULIN ANTIBODIES IN PATIENTS WITH COELIAC DISEASE AND THEIR RELATIVES.

(E.) Stevens, F. M.; Lloyd, R.; Egan-Mitchell, B.; Mylotte, M. J.; Fottrell, P. F.; Wright, R.; McNicholl, B.; McCarthy, C. F. (Dept. Gastroenterology, Univ. Coll., Galway, Ireland). *Gut* 16(8): 598-602, 1975.

The incidence of the reticulin antibody in the sera of patients with celiac disease and in the sera of members of their family was investigated. In addition, the relation of treatment to reticulin status in adults and children with celiac disease was analyzed. The sera of 83 celiac patients, 121 first-degree relatives, and 104 controls (63 biopsied symptomatic controls and 41 random control sera) were screened for the presence of reticulin antibodies. Among the untreated celiac patients, 75% of the adults and 93% of the children had reticulin antibody in their sera. No antibody was detected in any of the 30 treated celiac patients. All of the celiac disease patients showed clinical improvement on a gluten-free diet and repeat biopsies in 53 showed morphological and enzymatic improvement. The presence of reticulin antibody was unrelated to sex, blood group, fecal fats, serum iron, or mucosal lymphocyte count, but the serum IgG levels were significantly higher in the untreated adult celiac patients (mean, 1364 mg%) with reticulin antibodies than in similar patients with no antibodies (mean, 1085 mg%). Of the first-degree relatives, 21 were reticulin antibody positive; of the 17 in this group who were biopsied, 12 were found to have celiac disease. Biopsies in 65 first-degree relatives without reticulin antibody demonstrated celiac disease in two cases. Of the 68 relatives and 63 symptomatic controls with normal biopsies, five of the relatives and four of the controls were reticulin antibody positive. In two families with more than three celiac siblings, all affected children were reticulin antibody positive, none of the parents were positive, and there were no false positives among the normal children. Reticulin antibody thus appears to be a more sensitive indicator of gluten-sensitive enteropathy than any other screening procedure.

8744 ISOLATION AND CHARACTERIZATION OF AN AETIOLOGICAL AGENT IN WHIPPLE'S DISEASE.

(E.) Clancy, R. L.; Tomkins, W. A. F.; Muckle, T. J.; Richardson, H.; Rawls, W. E. (Dept. Medicine, McMaster Univ., Hamilton, Ontario, Canada). *Br. Med. J.* 3(5983):568-570, 1975.

The isolation and characterization of a cell wall deficiency bacterium which appears to be an etiological agent in Whipple's disease is reported. The bacterium was isolated from a prolonged lymph node culture established from tissue from a 40-yr-old woman with Whipple's disease. Primary cultures of blood, jejunal aspirate, bone marrow, and lymph node yielded no growth in normal or hypertonic culture media. However, whereas culture of a jejunal biopsy specimen yielded no growth in normal media, a cell wall-deficient bacterium grew out in hypertonic media. The morphology, staining, and growth characteristics were identical to those of the organism grown in the lymph node culture. The organism was a Gram-positive coccus identified as *Streptococcus dysgalactiae*. Monolayer cells taken from the lymph node culture at the time the bacterium was isolated were distended with diastase-resistant/PAS-positive material, and inoculation of the lymph node culture onto monolayers of human colon fibroblasts induced the accumulation of diastase-resistant/PAS-positive material within the cultured cells. When the organism was inoculated only to monolayers of human fibroblasts, it grew within the cells and stained positive with diastase-resistant/PAS. The organism was sensitive to tetracycline *in vitro*. The patient's serum contained antibody against the material within Whipple's disease macrophages and absorption of the patient's serum with the isolated organisms completely removed antibody activity. The data suggest that a pathogenic bacterium is the essential etiological agent in Whipple's disease and that the culture of Whipple's disease tissues in hypertonic media may have practical value.

8745 TREATMENT OF WHIPPLE'S DISEASE WITH SULPHAMETHOXAZOLE-TRIMETHOPRIM. *(E.)*

Elsborg, L.; Gravgaard, E.; Jacobsen, N. O. (Arhus Amtssygehus, Arhus, Denmark). *Acta Med. Scand.* 198(1/2):141-143, 1975.

The case report of a 45-yr-old man with Whipple's disease who responded rapidly to sulfamethoxazole-trimethoprim therapy was presented. Jejunal biopsy revealed enlarged coarse villi and lamina propria densely infiltrated with periodic acid-Schiff (PAS)-positive macrophages. Serum cobalamines and serum folates were low. Bone marrow aspiration demonstrated megaloblastic dysplasia and blood smears showed leukocytosis. Severe malabsorption was confirmed by abnormal findings in the Schilling test, folic acid absorption, D-xylose absorption, and glucose absorption tests, and by increased fecal lipid excretion. Therapy was instituted; the patient received two tablets twice a day, each tablet containing 400 mg sulfamethoxazole and 80 mg trimethoprim. After two months of treatment, the bone marrow, serum cobalamines and serum folates were normal, and jejunal biopsies showed less extensive infiltration of PAS-positive cells. At six months, there was no indication of malabsorption or steatorrhea, and hematological values were normal. Treatment was discontinued at 12 months, at which time the jejunal mucosa was almost normal; the villi were slender and only a small number of faintly PAS-positive cells were present in the lamina propria. The patient remained well three months after the discontinuation of treatment. These results suggest that sulfonamide combined with trimethoprim may be the drug of first choice in the treatment of Whipple's disease.

8746 RECURRENT APHTHOUS ULCERATION AND ITS ASSOCIATION WITH COELIAC DISEASE [abstract].

(E.) Ferguson, R.; Basu, M. J.; Asquith, P.; Cooke, W. T. (Gen. Hosp., Birmingham, England). *Gut* 16(5): 393, 1975.

8747 DEPLETION OF THYMUS-DEPENDENT LYMPHOCYTES IN ADULT COELIAC DISEASE [abstract]. *(E.)* O'Donoghue, D. P.; Lancaster-Smith, M.; Kumar, P. J. (St. Bartholomew's Hosp., London, England). *Gut* 16 (5):392-393, 1975.

8748 USE OF AN IMPROVED JEJUNAL CULTURE SYSTEM FOR THE STUDY OF NORMAL AND COELIAC MUCOSA [abstract]. *(E.)* L'Hirondel, C.; Doe, W. F.; Peters, T. J. (R. Postgrad. Med. Sch., London, England). *Gut* 16(5):392, 1975.

8749 ADAPTIONS OF INTESTINAL STRUCTURE FOLLOWING JEJUNOILEAL BYPASS FOR MASSIVE OBESITY [abstract]. *(E.)* Owen, R. L. (VA Hosp., San Francisco, Calif.). *Gastroenterology* 68(4):1083, 1975.

8750 AN EXPLANATION FOR THE PRESENCE OR ABSENCE OF HYPEROXALURIA IN PATIENTS WITH JEJUNOILEAL BYPASS [abstract]. *(E.)* Earnest, D. L.; Williams, H. E.; Admirand, W. H. (San Francisco Gen. Hosp., San Francisco, Calif.). *Gastroenterology* 68 (4):1072, 1975.

8751 THE EFFECT OF AGE ON INTESTINAL ABSORPTION [abstract]. *(E.)* McKnight, W. D.; Smart, D. F.; Texter, Jr., E. C. (VA Hosp., Little Rock., Ark.). *Gastroenterology* 68(4):1059, 1975.

8752 ENTERIC LOSS OF LYMPHOCYTES IN CELIAC DISEASE AND IN CROHN'S DISEASE [abstract]. *(E.)* Douglas, A. P.; Westman, A. P.; Haggith, J. (Med. Sch., Newcastle upon Tyne, England). *Gastroenterology* 68(4):1056, 1975.

8753 INTRACTABLE SPRUE SUCCESSFULLY TREATED BY TOTAL PARENTERAL ALIMENTATION (TPA) FOLLOWED BY SELECTIVE PROTEIN-RESTRICTED DIET [abstract]. *(E.)* Baker, A.; Wagonfeld, J. B.; Rosenberg, I. H. (Dept. Med., Univ. Chicago, Ill.). *Gastroenterology* 68(4):1054, 1975.

8754 ABSORPTIVE AND DIGESTIVE FUNCTION IN PERNICIOUS ANEMIA [abstract]. *(E.)* Lyford, C. L.; Folscroft, J.; Arvanitakis, C. (Kansas Univ. Sch. Med., Kansas City, Kans.). *Gastroenterology* 68(4): 1053, 1975.

8755 THE ENDOSCOPIC APPEARANCE OF THE DUODENUM IN WHIPPLE'S DISEASE [abstract]. *(E.)* Salyer, W. R.; Milligan, F. D.; Bayless, T. M.; Yardley, J. H. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Gastroenterology* 68(4):1048, 1975.

8756 DISTURBANCES OF INTESTINAL ABSORPTION DURING AGAMMAGLOBULINAEMIA. *(Pol.)* Zalewski, T.; Gutkowska, J.; Kapuscinska, A. (Z III Kliniki Ogolnopediatrycznej Inst. Pediatrii, Warsaw, Poland). *Pediatr. Pol.* 50(5):597-606, 1975.

8757 ENTEROTOXIGENIC INTESTINAL BACTERIA IN TROPICAL SPRUE. IV. EFFECT OF Klebsiella pneumoniae ENTEROTOXIN ON INTESTINAL TRANSPORT IN THE RAT [abstract]. *(E.)* Klipstein, F. A.; Horowitz, I. R.; Engert, R. F. (Univ. Rochester Sch. Med., Rochester, N.Y.). *Gastroenterology* 68(4):927, 1975.

8758 SIGNIFICANCE OF THE SCHILLING TEST (ABSORPTION OF MARKED VITAMIN B_{12}) IN DIGESTIVE PATHOLOGY. *(Fr.)* Bernier, M. J. J. (Hosp. Sainte-Lazare, Paris, France). *Bordeaux Med.* 8(6):639-643, 1975.

8759 SPECIFIC VITAMIN B_{12} MALABSORPTION (IMERSLUND'S DISEASE) AND ITS TREATMENT. *(Fr.)* Odievre, M.; Pigot, J. Y. (no affiliation given). *Arch. Fr. Pediatr.* 32(2):185-189, 1975.

8760 A PHYSICOCHEMICAL BASIS FOR TREATMENT OF ENTERIC HYPEROXALURIA [abstract]. *(Eng.)* Earnest, D. L.; Williams, H. E.; Admirand, W. H. (San Francisco Gen. Hosp., San Francisco, Calif.). *Clin. Res.* 23(3)439A, 1975.

8761 EXPERIMENTAL OSMOTIC DIARRHEA: CARBOHYDRATE INTAKE EFFECTS ON INTESTINAL DISACCHARIDASES [abstract]. *(Eng.)* Pergolizzi, R.; Lifshitz, F.; Teichberg, S.; Wapnir, R. A. (North Shore Univ. Hosp., Manhasset, N. Y.). *Fed. Proc.* 34(3):900, 1975.

8762 RETICULUM CELL SARCOMA AS A COMPLICATION OF SPRUE. *(Ger.)* Schulz, H. J.; Witter, H.; Martin, H.; Reitzig, P.; Dietze, F.; Lisewski, G. (Bereich Medizin [Charite], Humboldt-Universitat, Berlin, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 35(2):81-90, 1975.

8763 THE INCIDENCE OF ABSORPTION IN SMALL CHILDREN: AN EPIDEMIOLOGICAL STUDY. *(Ger.)* Wedekind, U.; Konig, K.; Fiehring, C. (Medizinische Akademie, Erfurt, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 35(2):66-70, 1975.

8764 SMALL-INTESTINAL HISTOLOGY IN COELIAC DISEASE. *(Eng.)* Walker Smith, J.; Kilby, A. (Queen Elizabeth Hosp. Children, London, E28PS England). *Lancet* 2(7925):132, 1975.

8765 VIRUS-LIKE PARTICLES IN JEJUNAL MUCOSA. *(Eng.)* Tomkins, A. N.; Wright, S. G.; Bird, R. G.; James, W. P. T. (London Sch. Hygiene Tropical Medicine, London, NW1 2PE, England). *Lancet* 2(7923):36-37, 1975.

8766 PROTEIN-LOSING ENTEROPATHY ASSOCIATED WITH CHRONIC PERICARDITIS WITH EFFUSION. *(Fr.)* Losay, J. (Hopital Enfants, F 94270 Bicetre, France). *Arch. Fr. Pediatr.* 32(6):285-290, 1975.

8767 SCLEROSIS OF THE INTESTINAL LYMPHATICS. *(Fr.)* Servelle, M.; Turiaf, J.; Albeaux-Fernet, M.; Laroche, C.; Bernier, J. J.; Soulie, J.; Bacourt, F.; Chabot, J.; Fournier, D.; Andrieux, J. B. (Hopital Saint-Michel, 33, rue Olivier Serres, 75015 Paris, France). *Sem. Hop. Paris* 51(12)799-806, 1975.

8768 RADIOLOGICAL EXAMINATION IN THE LACTASE DEFICIENCY SYNDROME. *(It.)* Bartoli, E.; Nerli, A.; Giudici, G. (Istituto di Radiologia, Universita, 67 via Roma - I-56100 Pisa, Italy). *Radiol. Med.* 61(1):1-11, 1975.

8769 BACTERIAL CULTURE OF JEJUNAL MUCOSA IN CHILDHOOD CELIAC DISEASE. *(Eng.)* Evans, N.; Brueton, M. J.; Turner, P. J.; McNeish, A. S. (Univ. Birmingham, Inst. Child Health, Francis Rd., Birmingham B16 8ET, England). *Lancet* 2(7923):435-36, 1975.

8770 SYMPTOM RESPONSE TO LACTOSE REDUCED MILK IN LACTOSE INTOLERANT ADULTS. *(Eng.)* Jones, D. V.; Latham, M. C.; Kosikowski, F. V.; Woodward, C. (Division of Nutritional Sciences, Cornell Univ., Ithaca, N. Y.). *Fed. Proc.* 34(3):930, 1975.

8771 LACTOSE TOLERANCE IN MEXICAN AMERICAN CHILDREN [abstract]. *(Eng.)* Woteki, C. E.; Weser, E.; Young, E. A. (Univ. Texas Health Sci. Cent., San Antonio, Tex.). *Clin. Res.* 23(3):462A, 1975.

8772 STUDIES OF CALCIUM METABOLISM IN LACTASE DEFICIENCY IN MAN [abstract]. *(Eng.)* Spencer, H.; Kramer, L.; Norris, C. (VA Hosp., Hines, Ill.). *Clin. Res.* 23(3):462A, 1975.

8773 ENTEROTOXIGENIC INTESTINAL BACTERIA IN TROPICAL SPRUE. III. PRELIMINARY CHARACTERIZATION OF Klebsiella pneumoniae ENTEROTOXIN [abstract]. *(Eng.)* Klipstein, F. A.; Engert, R. F. (Univ. Rochester Sch. Med., Rochester, N. Y.). *Clin. Res.* 23(3):252A, 1975.

8774 THE INCIDENCE AND APPEARANCE OF METABOLIC BONE DISEASE IN NON TROPICAL SPRUE [abstract]. *(Eng.)* French, A. B.; Garn, S. M.; Poznanski, A. K. (Dept. Int. Med., Univ. Michigan, Ann Arbor, Mich.). *Clin. Res.* 23(3):549A, 1975.

8775 JEJUNAL HYDROLYSIS AND UPTAKE OF CONJUGATED FOLATE IN TROPICAL SPRUE [abstract]. *(Eng.)* Halsted, C. H.; Reisenauer, A. M.; Coreino, J. J. (Dept. Med., Univ. California, Davis, Calif.). *Clin. Res.* 23(3):457A, 1975.

8776 WHIPPLE'S DISEASE. *(Ger.)* Franken, F. H.; Boenigk, U.; Schmitt, H.; Falck, J. (Innere Abteilung, Krankenhauses St. Josef, Wuppental-Elberfeld, Germany). *Dtsch. Med. Wochenschr.* 100(25): 1390-1392, 1975.

8777 INTESTINAL LIPODYSTROPHY (WHIPPLE'S DISEASE): A RARE CAUSE OF SPRUE SYNDROME. *(Ger.)* Zabaidi, G. (Klinik Innere Medizin, Univ., 25 Rostock, Ernst-Heydemann Strasse, Germany). *Z. Gesamte Inn. Med.* 30(13):454-457, 1975.

8778 THE CAUSES OF CHOLEREIC ENTEROPATHY. *(Ger.)* Ewe, K. (I. Medizinische Klinik Poliklinik, Universitat, 65 Mainz, Langenbeckstr. 1, Germany). *Dtsch. Med. Wochenschr.* 100(32):1639-1640, 1975.

8779 DERMATITIS HERPETIFORMIS AND CELIAC DISEASE. *(Fr.)* Rousseau, B. (Centre hospitalier, Universite Laval, 2705, boul Laurier, Ste-Foy, Quebec, Canada). *Union Med. Can.* 104(9):1365-1368, 1975.

8780 IMMUNOGLOBULIN A DEFICIENCY IN SPRUE. *(Rus.)* Gurnicki, B.; Krupinska-Sanecka, I. (Inst. Pediatrics, Warsaw, Poland). *Vopr. Okhr. Materin. Det.* 20(6):40-41, 1975.

See also, 8412, 8413, 8429, 8453, 8537, 8690, 8691, 8693, 8697, 8700, 8734, 8854, 8977, 9334, 9388.

LARGE INTESTINE

8781 HYPOTONIC COLON EXAMINATION WITH GLUCAGON. *(E.)* Miller, R. E.; Chernish, S. M.; Skucas, J.; Rosenak, B. D.; Rodda, B. E. (Indiana Univ. Sch. Medicine, Indianapolis, Ind.). *Radiology* 113(3):555-562, 1974.

The influence of exogenous glucagon, atropine sulfate, and glucagon plus atropine sulfate on the barium enema examination was reported. Twelve male asymptomatic volunteers, aged 20-45 yr, participated in the double-blind crossover study. Drug doses evaluated

were: 2 mg glucagon, 1 mg atropine sulfate, and 1 mg atropine sulfate plus 2 mg glucagon; the glucagon-diluting solution acted as a placebo. Each dose consisted of two i.m. injections and each subject received all four drugs. Patients were asked to rate any discomfort after injection, when the barium reached the colon, and when the barium flow ceased. Radiologic examination included: extent of reflux, ease of examination, and rate of small intestine filling. The amount of time needed to reach cecum and fill small intestine were recorded. The width of the sigmoid, descending, transverse, ascending colon, cecum, and ileum along with length of small intestine were measured. There was little treatment effect except for a reduction in width of transverse colon (5.2 to 2.7 cm) and a decrease in width of terminal ileum (2.2 to 1.8 cm) after atropine sulfate treatment. The length of the ileum and the width of ceca increased after glucagon. Atropine sulfate increased the pulse rate from 78 to 92 after one hr whereas glucagon had no effect on pulse rate. Glucagon best facilitated the barium examination and produced the least number of negative side effects. The combination of glucagon plus atropine sulfate produced the most side effects. Marked discomfort was noted only with spasms. Glucagon relaxed the colon and was suggested for use in patients with motility problems.

8782 FUNCTION OF THE ANAL SPHINCTERS IN SPINAL MAN. *(E.)* Frenckner, B. (Serafimer Hosp., Stockholm, Sweden). *Gut* 16(8):638-644, 1975.

Eight male patients (mean age, 35 yr) with traumatic transverse lesions of the spinal cord and eight healthy controls were examined with respect to the function of the anal sphincters. Continuous recordings of anal pressure and electromyograms (EMG) from the striated sphincter muscles were obtained during gradual rectal distension by means of an air-filled balloon. The corrected rectal pressures at various volumes of the rectum were similar for patients and controls. Both groups showed continuous tonic EMG activity of the external sphincter and the puborectalis muscle; the anal reflex was positive in all cases. Inflation reflexes of the striated muscles were recorded in six patients and in all controls when the rectum was expanded. The rectal volumes at which the first inflation reflex occurred were significantly higher among the patients. Upon further distension of the rectum, the electrical activity of the striated muscles gradually decreased and ultimately ceased in seven patients compared with only one of the controls. In the remaining patient and controls, the electrical activity was unchanged or increased as long as the rectal filling proceeded. The rectal volumes at which electrical activity was lost were significantly smaller among the patients. The patients showed a normal anal pressure at rest and a more pronounced relaxation and constant relaxation of anal pressure upon distension of the rectum. It is concluded that upon rectal distension in normal man, the striated muscles are stimulated by a cerebral center at a subconscious level as well as by a low center of the spinal cord. The former accounts for an augmented inflation reflex and maintained or increased electrical activity when rectal distension is substantial. In contrast, the smooth internal sphincter is independent of cerebral influence at rest as well as during rectal distension.

8783 POSTOPERATIVE MOTILITY OF THE LARGE INTESTINE IN MAN. *(E.)* Wilson, J. P. (Queen Mary's Hosp., Sidcup, Kent, England). *Gut* 16(9):689-692, 1975.

Motor activity of the colon in the immediate postoperative period was studied in 36 patients using radiotelemetering capsules, radioopaque markers, and serial abdominal radiographs. Of the 36 patients, 16 had gastrointestinal tract operations, eight had intraperitoneal operations, four had retropubic prostatectomies, and eight had nonabdominal operations. The variables recorded were the return of segmental pressure activity, the first passage of flatus, the passage of 80% of the markers in stools, and the time at which colonic distension decreased on radiographs. Return of segmenting pressures and passage of flatus were delayed in all cases, but more significantly where an abdominal incision was made. Colonic pressure activity returned about 16 hr after nonabdominal operations, whereas activity was not recorded until 40 to 48 hr after abdominal operations. The first passage of flatus occurred 16 hr after nonabdominal operations compared with a delay of 68 and 110 hr after gastrectomy and colectomy, resp. Neither the length of the operation nor the amount of postoperative analgesia (Omnopon) had any significant effect on the duration of colonic ileus. Gaseous distension after laparotomy was confined to the colon. It is suggested that wind pains after abdominal surgery coincide with the return of colonic motility, and probably represent attempts at contraction by an already distended colon.

8784 COLONIC MOTILITY IN MAN. *(E.)* Duthie, H. L. (Sheffield Royal Infirmary, England). *Mayo Clin. Proc.* 50(9):519-522, 1975.

The difference in electrical patterns in intestinal motility between the rectum and colon in man was investigated. Myoelectrical activity was studied in 150 subjects using suction, implanted and cutaneous electrodes. Electrical records were submitted for computer analysis to give measurements of the frequency of slow wave activity and to establish the time duration of regular wave activity. Motility was assessed as a percentage of the recorded time when motor waves were present. Two rhythms of slow wave were found; a slower one at 2.5 to 4.0 cycles/min and a faster one at 6.0 to 12.0 cycles/min. Pentagastrin, at 6 μg/kg/hr, i.v., affected only the slower rhythm and neostigmine (0.5 mg, i.m.) affected only the faster frequency rhythm. Two gradients appeared in the colon; one was based on a faster frequency of slow waves and the other on the percentage and incidence of regular slow wave activity. In the colon, unlike the small intestine, the percentage of time occupied by regular slow

waves was greatest on the right side and decreased through the descending and sigmoid colon and rectum with a sharp increase in the lowest rectum. The two factors that may be responsible for the delay in transit in the rectum are: that the proportion of the faster frequency rhythms of slow waves is greater and is associated with a higher proportion of motor activity; and that there is a similar preponderance of the faster frequency of slow waves and motor activity in the lower rectum. Theoretically, it is possible to use a chain of relaxation oscillators to produce the two frequencies of slow waves in each area of the colon with periods of no wave activity.

8785 EFFECT OF LACTULOSE ON RABBITS FED ON A LOW RESIDUE DIET. *(E.)* Hodgson, J. (St. George's Hosp., Merton Pk., London, England SW17 0QT). *Am. J. Gastroenterol.* 64(2):115-121, 1975.

The effect of lactulose (4-O-β-galactopyranosyl-D-fructose; 2 ml/kg/day administered through an orogastric tube for 4 mo) was tested on six New Zealand rabbits maintained on a low residue diet representative of the diet ingested by older persons in Western countries. The diet consisted of white bread, butter, milk and sugar supplemented by complan, a nutritive powder preparation. Wet fecal weight, fecal pH, and transit times were measured daily in these rabbits and in six control rabbits given only the low-residue diet. Intracolonic pressure measurements were obtained at the beginning and the end of the experiment. The controls developed a very low fecal output, with mean monthly values of fecal weight varying between 2 and 4.6 g, increased transit times of 48 hr, and intracolonic pressures that increased over four months from a colonic motility index (CMI) of 12,261 to a CMI of 28,084 in response to neostigmine (0.05 mg/kg). The rabbits given lactulose did not develop diarrhea but produced three times the wet fecal weight of the rabbits on the diet alone, with mean values ranging from 9.4 to 12.4 g. Transit times remained at 24 hr (a normal transit time for rabbits on a regular laboratory diet), and intracolonic pressures rose only from a CMI of 11,652 to a CMI of 14,263 at the end of four months. Longitudinal sections from rabbit colon after four months on the low-residue diet showed thinning of the apex of the haustrum and thickening of the interhaustral fold. These changes were less marked in the presence of lactulose. These results suggest that lactulose may help prevent symptoms of diverticular disease in elderly persons on a low-residue diet by increasing fecal bulk, decreasing transit times, and reducing segmental pressures.

8786 THE EFFECT OF PERITONEAL LAVAGE ON THE POSTOPERATIVE COURSE AFTER COLONIC ANASTOMOSIS AND PERFORATION IN THE RAT. *(E.)* Arnesjo, B.; Breland, U.; Petersson, B. G. (Univ. Hosp., Lund, Sweden). *Acta Chir. Scand.* 141(5):433-436, 1975.

The effects of peritoneal lavage on the postoperative course were evaluated in Wistar rats subjected either to transection and re-anastomosis of the descending colon (20 rats) or to perforation of the descending colon (10 rats) or cecum (10 rats). Control rats underwent the same operative procedures but did not receive peritoneal lavage. The parameters studied were the presence of abdominal adhesions, peritonitis, fluid in the abdomen, anastomosis leakage, mortality and survival time. Compared with controls, the rats treated with lavage after colonic anastomosis had markedly fewer and less serious adhesions when autopsied 11 or 60 days after surgery. No leakage of the anastomosis, peritonitis, or peritoneal fluid was found in rats who had undergone lavage. Untreated rats showed no sign of anastomosis insufficiency, but on the 11th postoperative day all but one had turbid fluid in the abdominal cavity and some had peritonitis. Four of ten rats not treated with peritoneal lavage after perforation of the descending colon died of severe peritonitis, whereas all ten treated rats survived. Peritonitis, adhesions, and fluid were found in the surviving untreated rats autopsied on day 11 but in none of the treated rats. Four of ten rats treated by lavage after perforation of the cecum died on the second to the fifth postoperative day. All animals not given lavage treatment died within 18 hr of the operation; thus, the development of adhesions could not be evaluated. Aspirated fluid from rats which died despite lavage treatment contained blood and pus for a longer period than that of the surviving rats. At autopsy these rats did not have the omental covering of the perforations unlike those alive after 11 days. In an additional group of ten rats, the catheter alone did not cause adhesions or peritonitis. These results confirm that peritoneal lavage does not cause impaired healing of colonic anastomoses or perforations.

8787 PERSISTENT HYPOTENSION AND INTESTINAL INFARCTION IN A PATIENT WITH PRIMARY AMYLOIDOSIS. *(Eng.)* Mallory, A.; Struthers, J. E., Jr.; Kern, F., Jr. (Univ. Colorado Medical Center, Denver, Colo.). *Gastroenterology* 68(6):1587-1592, 1975.

A case of primary amyloidosis in which the major symptoms were caused by vascular insufficiency of the intestine is reported. A 65-yr-old man was hospitalized with a history of shortness of breath, ankle edema, weight loss, anorexia, and watery, bloody diarrhea. His blood pressure was 85/60 with a pulse of 90/min. A chest X-ray showed mild osteoporosis; and EEG indicated low limb voltage and nonspecific ST-T wave changes; a bone marrow biopsy gave evidence of milk plasma cell hyperplasia and decreased iron; and sigmoidoscopy revealed that above 10 cm, the bowel mucosa was edematous and friable with ulcerations and large raised lesions. The gross and microscopic appearance of the sigmoid and rectum appeared to be due to ischemia. A transfemoral abdominal aortogram and selective superior mesenteric angiogram revealed a marked prolongation of opacification of the middle and left colic arteries and the small and large bowel. No veins were seen draining the small bowel or transverse colon. The patient abruptly developed severe diffuse abdominal pain, followed by bright red rectal bleeding

and anuria. Abdominal examination showed only moderate, diffuse tenderness which later became severe with rebound. Vital signs were unchanged except for a heart rate of 120 per min. Laparotomy revealed a severely ischemic and questionably viable bowel with numerous small subserosal and submucosal hemorrhages and shallow mucosal ulcerations. The entire intestinal tract was friable. The patient died of cardiac arrest during surgery. At autopsy, the intestinal lesion was found to involve the lower 1/3 of the esophagus, as well as the stomach, ileum, and colon. Microscopic examination showed amyloid in the heart, liver, spleen, lungs, pancreas, kidneys, testes, and in the mucosa and submucosa of the intestinal tract. It is suggested that chronic hypotension resulting from the nephrotic syndrome led to decreased splanchnic perfusion, and that amyloid deposits within the intestinal blood vessel walls further impaired perfusion by impeding blood flow. Gastrointestinal bleeding caused further splanchnic vasoconstriction and more severe ischemia.

8788 ACUTE APPENDICITIS IN PREGNANCY. *(E.)* Rosemann, G. W. E. (Tygerberg Hosp., Parawvallei, CP). *S. Afr. Med. J.* 49(36):1459-1463, 1975.

The diagnosis and treatment of six cases of acute appendicitis during pregnancy were discussed. Two cases were misdiagnosed: a 30-yr-old woman (at 34 weeks of gestation) as having degeneration of a fibroid and a 34-yr-old woman (22 weeks of gestation) as having an obstruction of the right ureter. The initial incorrect diagnoses increased the danger from abscesses and infection. Alder's sign was present in four of six cases with painful ballottement. The inability to diagnose early was the most important cause of high morbidity during this condition. Diagnosis may be difficult because the early clinical signs of appendicitis are similar to those of pregnancy. Vague pain in right quadrant, nausea, and vomiting should not be ignored during pregnancy. A furred tongue and increasing tachycardia are the most constant clinical signs of appendicitis. Pyrexia, rebound tenderness, muscle guarding, and rigidity may be absent due to the stretching of the anterior abdominal muscles. If pain is constant, it is more likely to be of extra-uterine origin. The "heel-stamping" sign was another useful diagnostic tool. Leukocyte counts are unreliable unless done serially along with sedimentation rate. The prognosis of acute appendicitis in pregnancy is directly proportional to the duration of symptoms and early diagnosis. The dangers of negative laparotomy are minimal.

8789 APPENDICITIS AND MIMICKING CONDITIONS: A PROSPECTIVE STUDY. *(E.)* Gilmore, O. J. A.; Browett, J. P.; Griffin, P. H.; Ross, I. K.; Brodribb, A. J. M.; Cooke, T. J. C.; Higgs, M. J.; Williamson, R. C. N. (Royal Berkshire Hosp., Reading, England). *Lancet* 2(7932):421-424, 1975.

A prospective study of 444 consecutive patients, 228 male and 216 female, aged 0 to 50 yr, treated for appendicitis was carried out. The state of the appendix was classified as being one of the following: not inflamed, acutely inflamed, gangrenous, or perforated. At operation, a swab was taken from the outer appendix wall *in situ* for bacterial examination using gram film, blood agar and MacConkey plates. Accuracy of diagnosis was studied in relation to the state of appendix, the sex and age of the patient. Only 346 of 444 patients had acutely inflamed, gangrenous or perforated appendices. The overall diagnostic error was 22% and was higher in females than in males. Diagnostic error was highest in females between zero to ten yr (32%) and 11 to 20 yr (31%) with the lowest error for females aged 31 to 50 yr (15%). The highest diagnostic error for males occurred at age 11 to 20 (22%) with the lowest at age 21 to 30 yr (3%). Generally, acute appendicitis was suspected and proven most common in males during the first decade of life. A perforated appendix was found more frequently in younger and older patients with an overall incidence of 10%. The diagnostic accuracy for the 26 doctors, with full range of experience, varied from 54% to 95%. The most prominent conditions mimicking appendicitis were the following: non-specific mesenteric adenitis (12%), tubo-ovarian disorders, ovarian cysts, salpingitis, menstrual bleeding, fibroid uterus, and round-ligament strain associated with pregnancy. Gynecological disorders occurred more frequently in women over 30 yr of age. The incidence of bacterial isolation increased according to the severity of infection: acute infection, 18%, gangrenous, 38%, perforated, 82%. *Escherichia coli*, *Pseudomonas aruginosa*, bacteroides and *Streptococcus fecalis* were most common. Acute appendicitis is solely a clinical symptom. Care was urged in preventing unnecessary operations, particularly in women.

8790 PHYTOHEMAGGLUTININ-STIMULATED IMMUNE RESPONSE: ASSAY IN COLORECTAL CARCINOMA PATIENTS. *(E.)* Kaplan, M. S.; Mino, F. O.; Kummerfeld, K. B.; Lundak, R. L. (Dept. Surgery, Univ. California, 5901 E. Seventh St., Long Beach, Calif.). *Arch. Surg.* 110(10):1217-1220, 1975.

The response of lymphocytes from patients with colorectal cancer to phytohemagglutinin (PHA) stimulation in the presence or absence of control sera or tumor sera was investigated. The response was measured by tritiated thymidine incorporation. Eighteen colorectal cancer patients (aged 47-86 yr) and 18 controls without colorectal cancer (aged 39-61 yr) were studied. Eleven of the 18 cancer patients had metastatic type and seven had localized forms of carcinoma. Lymphocyte suspensions were prepared by the Ficoll-Hypaque gradient method. The activity of sera from cancer patients was investigated for its ability to inhibit PHA-induced DNA synthesis by lymphocytes. Cells were incubated for three days in 5% CO_2 and 95% air at 37 C and then pulsed with 1 μCi of tritiated thymidine; incorporation was measured by liquid scintillation. The mitotic indices (MI) of PHA-stimulated lymphocytes of control patients varied from 0.7 to 116 (mean, 29.2); the MI of PHA-stimulated cells from cancer patients varied from 2.0 to 60 (mean, 24.9). The MI values for

cells from localized carcinoma varied from 4 to 52 (mean, 23.1) and metastatic cancer MI values ranged from 4 to 52 (mean, 26). Upon addition of autologous sera, the MIs for controls varied from 1 to 111 (mean, 39.6); for cancer patients the variation was 9 to 155 (mean, 48); for localized cancer, MI varied from 9 to 155 (mean, 48.4); and for metastatic cancer, MI ranged from 11 to 148 (mean, 47.7). With addition of sera from cancer patients, the MI varied from 1 to 206 (mean, 47.5), 2 to 104 (mean, 47.1), 2 to 88 (mean, 53.6), and 5 to 104 (mean, 43.8) for the controls and patients with colorectal, localized, and metastatic cancers, resp. The MI values from each incubation condition were not significantly different from controls. It is concluded that lymphocytes from patients with colorectal carcinoma were not inhibited in their response to PHA.

8791 COLONIC CARCINOMA: CLINICOPATHOLOGICAL CORRELATION WITH IMMUNOREACTIVITY. *(E.)*
Pihl, E.; Hughes, E. S. R.; Nind, A. P. P.; Nairn, R. C. (Monash Univ. Medical Sch., Alfred Hosp., Medbourne, Australia). *Br. Med. J.* 3(5986):742-743, 1975.

The relation between tumor spread, histological differentiation, and *in vitro* antitumor immunoreactivity was studied in 132 patients (67 men and 65 women, mean age 61 yr) with adenocarcinoma of the large intestine. Tumor spread was classified according to Kirklin's modification of Duke's classification. Seventy-nine tumors were confined to the wall of the colon and adjacent fat, and 53 had metastasized to the regional lymph nodes. The histologic differentiation was graded as good in 25 cases in which tumors formed glands similar to those of the normal mucosa and with little cellular atypia. In 33 cases in which the tumors formed only a few irregular glands with marked cellular atypia, the histological differentiation was graded as poor; and in 74 in which tumor differentiation was intermediate, it was graded as average. Blood lymphocyte antitumor cytotoxicity was significantly more common in patients with localized tumors (43%) than in those who already had metastases (17%). Peripheral blood lymphocyte antitumor cytotoxicity was also significantly more common in patients with well-differentiated tumors (64%) than in those with average or poorly differentiated tumors (25%). Only four of the 25 patients with well-differentiated tumors had lymph node metastases in contrast to 49 of 107 with tumors of poorer differentiation. Three of 34 surviving patients with cytotoxic lymphocytes had clinical signs of recurrence compared with 17 of 73 without such immunoreactivity. The positive correlations between lymphocyte antitumor cytotoxicity and histological differentiation, localized growth, and fewer recurrence suggest a better long-term prognosis.

8792 PRIMARY LINITIS PLASTICA CARCINOMA OF THE COLON. *(E.)* Raskin, M. M.; Viamonte, M.; Viamonte, M., Jr. (Mount Sinai Medical Center, Miami Beach, Fla.). *Radiology* 113(1):17-22, 1974.

Two case studies were reported of patients with primary linitis plastica carcinoma of the colon. Case I was a 34-yr-old female admitted with a three-month history of abdominal cramps and narrow, bloody stools. No previous weight loss was evident. Abdominal palpation and laboratory findings were normal. Sigmoidoscopy revealed a localized "cobblestone" appearance of the mucosa. Biopsy showed inflammation. A barium examination showed a 12 cm long stenotic lesion with mucosal ulceration at the rectosigmoidal junction. Laparotomy was performed and a 7 cm indurated area was removed. The lumen was narrowed due to a thickening of the wall to 7 mm. Pericolic fat contained round, firm 3 mm nodules. A microscopic examination of the lesion revealed a poorly differentiated mucinous carcinoma with infiltration of pericolic fat. The patient was readmitted after five months with another lesion in the same location and with bowel obstruction. This lesion was removed and showed a similar histologic appearance. Lymph nodes in both cases were free of tumor. The patient expired six months after the second operation; she had had continual bowel obstruction problems. Case II was a 71-yr-old male admitted with a two-month history of constipation. The abdomen was distended but no masses were palpated. A barium examination showed a stenotic lesion (4 cm) of the distal colon. An upper gastrointestinal series was normal. Six cm of colon was resected. The lumen was narrowed to 3.5 cm in circumference at the site of the lesion. The serosa underlying the lesion and the pericolic fat was retracted and firm. Microscopic examination showed a poorly differentiated carcinoma with numerous signet ring cells, and lymph and plasma cell infiltration. The patient was alive 16 months post-surgery. Generally, the clinical signs point to colitis and inflammation rather than to carcinoma. The lesions occur most often in the rectum and sigmoid colon. It is impossible to distinguish primary or secondary involvement if only one lesion is present. Diagnostic error and confusion with ulcerative colitis are frequent. The prognosis is often poor due to late diagnosis.

8793 THE CHANGING PATTERN OF HOSPITAL ADMISSIONS FOR DIVERTICULAR DISEASE OF THE COLON. *(E.)*
Kyle, J.; Davidson, A. I. (Royal Infirmary, Aberdeen, Scotland). *Br. J. Surg.* 62(7):537-541, 1975.

A retrospective study was made of all patients in northeastern Scotland admitted with colonic diverticular disease during two 4-yr periods. The presence of diverticula was confirmed by barium enema, by operation or at autopsy. Each patient also had at least two of the following clinical features: left-sided or lower abdominal pain; deep tenderness in the left iliac fossa; altered bowel habit; rectal bleeding; pyrexia over 37.5 C; and leukocytosis of 10^9/l, or more. During the first period (1958-1961), 206 patients were admitted with colonic diverticular disease, compared with 366 admitted in the second period (1968-1971). The age of the patients in the two periods was similar, ranging from 35 to 89 yr in the first group and from 32 to 95 yr in the second. Excluding middle-aged males, the increases in cases admitted in the second period over those in the first group were statistically significant at the 5% level for each of

the three 20-yr age goups (30-49, 50-69 and 70-89 yr of age). There were 74 men and 132 women admitted in the first period and 139 and 227, resp., admitted in the second period. This increase was proportionally greater for men than for women. The percentage of patients to be operated upon in the second period declined compared to the first. Colovesical fistula as a complication occurred in five patients in the first period and in four in the second period. The number of colonic perforations rose from 18 in the first period to 29 in the second, and the mortality rate for perforation also rose (from 28% to 39%). The overall mortality rate fell from 12.1% to 7.1%. It is suggested that the increase in admissions for this disorder has been partly due to a slight change in criteria for barium enema. It is concluded that the gradual aging of the population at risk is a major factor in the observed changes in admission rates for diverticular disease in northeastern Scotland.

8794 RECTAL DIVERTICULA. *(E.)* Damron, J. R.; Lieber, A.; Simmons, T. (Univ. Kentucky Medical Center, Lexington, Ky. 40506). *Radiology* 115(2):599-601, 1975.

Etiological, clinical and radiological findings of eight patients with rectal diverticula were presented. The patients were identified in a collective study of rectal diverticula at two institutions from 1907 to 1973. The patients ranged from 54 to 84 yr of age (average age 73) and males predominated 3:1. The number of diverticula/patient ranged from one to three, with an average of two. In each patient, rectal diverticula coexisted with colonic diverticula, especially in the sigmoid segment, suggesting an etiological process common to both types. The rectal diverticula were larger than the colonic (2.5 cm *versus* 0.5-1.0 cm) and only four of the eight patients presented with colonic complaints. Anatomically, all the rectal diverticula except two originated from the lateral wall of the rectal ampulla, suggesting a possible lateral weakness. The majority of patients were asymptomatic and required no surgery. However, surgical treatment becomes necessary when an inflamed diverticulum progresses to abscess formation and perforation. An inflamed rectal diverticulum may be confused with a carcinoma at endoscopy. It is suggested that inattention during barium enema examination may contribute to the low reported incidence of rectal diverticula, as well as overfilling of the rectum which may completely obscure the diverticula.

8795 PROLONGED SYMPTOMATIC AND RADIOLOGICAL REMISSION OF COLONIC GAS CYSTS AFTER OXYGEN THERAPY. *(E.)* Wyatt, A. P. (Brook Hosp., London, England). *Br. J. Surg.* 62(10):837-839, 1975.

Results of oxygen therapy in six patients (one man and five women, aged 53-78 yr) with pneumatosis cystoides intestinalis were described. The patients also presented with myocardial ischemia (1 case), chronic bronchitis and asthma (2 cases), pulmonary embolism and multiple hip surgery (1), asthma (1) and mitral valvotomy (1). All patients complained of frequent bowel actions and excessive flatus before therapy, four had mucus in stools, four had abdominal pain, three had frequent minor incontinence, and two had blood in stools. The physical signs of pneumatosis included an abdominal mass in three patients, rectal cysts in four, and cysts on sigmoidoscopy in five. During oxygen therapy, 8 liters/min of humidified oxygen was delivered through a mask resulting in 70 to 75% inspired oxygen and arterial oxygen concentrations greater than 300 mm Hg. Symptomatic relief was dramatic although two patients continued to have some mucus in stools and three complained of excessive flatus on followup. All the physical signs of pneumatosis disappeared during treatment but the mucosa still appeared edematous with a few hemorrhages on sigmoidoscopy at the end of treatment. Plain abdominal films showed the disappearance of encysted gas in every patient between the fourth and seventh day, while a barium enema examination performed the subsequent month revealed a return to normality in five cases. In the sixth case, residual cysts were visible in the region of the splenic flexure. One patient remained well at two yr. Pneumatosis recurred in two patients after one yr and 18 months, resp.; however, the symptoms were less severe than before and did not warrant further oxygen therapy. The presence of residual cysts in one patient at the end of treatment suggests that aggressive oxygen treatment should be continued for at least 48 hr after the complete radiologic disappearance of all cysts.

8796 SYMPATHETIC NEUROTRANSMITTER METABOLISM IN HIRSCHSPRUNG'S DISEASE. *(E.)* Touloukian, R. J.; Morgenroth, V. H., III; Roth, R. H. (Yale Univ. Sch. Medicine, New Haven, Conn. 06510). *J. Pediatr. Surg.* 10(5):593-598, 1975.

Tyrosine hydroxylase activity was measured from full thickness segments of aganglionic and ganglionic colon of three male children (aged 3 days to 5 months) to investigate the factors responsible for the elevation in tissue norepinephrine levels during Hirschsprung's disease. Homogenized tissue samples were centrifuged at 104,000 x *g* for 90 min at 4 C and the supernatant was analyzed for hydroxylase activity in conjunction with added calcium ions, calcium chelators (EGTA) or norepinephrine. The tyrosine hydroxylase activity of the aganglionic colon was three times that of the ganglionic segment. Addition of calcium (100 μM) caused a threefold increase in tyrosine hydroxylase activity (0.90 pM DOPA/mg protein/min to 2.29 pM DOPA/mg protein/min) only within isolates of ganglionic intestine. EGTA had no effect on enzyme activity in either tissue but blocked the calcium activation of tyrosine hydroxylase in ganglionic supernatant. Norepinephrine (2×10^{-4} M) caused a 60% inhibition of tyrosine hydroxylase activity in ganglionic supernatants and a 14% inhibition in aganglionic supernatants. The addition of calcium had no effect on the tyrosine hydroxylase inhibition by norepinephrine in aganglionic supernatants, but it reduced the inhibitory effect to 11% in ganglionic supernatants. Patients with Hirschsprung's disease lack the intramural

ganglionic cell which normally coordinates muscular activity by balancing the motor effects of the preganglionic cholinergic fibers with the inhibitory influence of the postganglionic adrenergic terminals. The elevation of tyrosine hydroxylase activity in aganglionic colon and its insensitivity to exogenous calcium or norepinephrine is further evidence of sympathetic overactivity in the aganglionic colon and suggests a basic enzymatic abnormality in the pathogenesis of this disease.

8797 NEONATAL SMALL LEFT COLON SYNDROME: INTRAMURAL NOT INTRALUMINAL OBSTRUCTION. *(E.)* Philippart, A. I.; Reed, J. O.; Georgeson, K. E. (Children's Hosp. Michigan, Detroit, Mich. 48202). *J. Pediatr. Surg.* 10(5):733-740, 1975.

The characteristic findings of low intestinal obstruction in infants of diabetic mothers are described. Eight cases of small left colon syndrome were selected. All cases showed abdominal distention, bile-strained vomitus, absent spontaneous passage of meconium, and normal ganglion cell population. Gestation age varied from 36 to 40 weeks (mean age, 38 weeks). Initial radiologic findings were indistinguishable from Hirschsprung's disease. Four cases required surgery: two infants with cecal perforation and two with obstruction. Three of these four were treated by a colostomy and one case was exteriorized. All four biopsies were normal. The uncomplicated cases responded to barium enemas and nasogastric suction with a gradual increase in oral feeding. Meconium analysis was unreliable; evacuation of suspected meconium did not always correct the clinical picture. Hypoglycemia was present in all cases, but there was no correlation between its severity and the clinical course. Hyperbilirubinemia was frequent. Lasting symptoms of partial obstruction even after evacuation and incidence of late perforation of the cecum supported the impression that the syndrome results from an intramural rather than an intraluminal obstruction. The relation between glucose metabolism and bowel obstruction suggested a neurohumoral mechanism; the presence of glucagon decreased the motility of the descending colon, and hypoglycemia increased vagal stimulation to the midgut region. These concurrent stimuli produced a transition zone between midgut and hindgut that altered intestinal function.

8798 MUCOCELES OF THE APPENDIX. *(E.)* Qizilbash, A. H. (Henderson General Hosp., Hamilton, Ontario, Canada L8V 1C3). *Arch. Pathol.* 99(10):548-555, 1975.

Sixty-four cases of hyperplastic polyp, mucinous cystadenoma, and cystadenocarcinoma of the appendix were studied in relation to the development of mucocele and "pseudomyxoma peritonei." In eight of the 33 with hyperplastic polyp (25 women and 8 men, aged 16-82 yr), the lesion was associated with mucinous cystadenoma. Three of these patients had multiple small hyperplastic and adenomatous polyps present in the adjacent mucosa of the cecum and ascending colon. Histologically, the polyps revealed hyperplastic tubules with saw-toothed appearance. In 11 of the 33 patients, paneth cells were identified in gland crypts. Argentaffin cells were also present. Mucinous cystadenoma was found in 35 cases (26 women and 9 men, aged 22-82 yr). Among these patients, the most common abnormality was cystic dilation (1-6 cm) of the lumen at the distal end. Dilated lumens were filled with thick, gelatinous mucus. The inflammatory reaction consisted of lymphocytes, macrophages, and foreign-body giant cells. The epithelium was thrown into papillary processes that were lined by columnar mucus-secreting epithelium with basal hyperchromic nuclei. Eight cases had hyperplastic foci. Generalized pseudomyxoma peritonei was rare. Five patients had mucinous cystadenocarcinoma (3 women and 2 men, aged 45-85 yr). In four cases, the appendix was transformed into mucocele. The gross appearance of the mucocele, cellular growth and nuclear atypia was more severe than in cystadenoma. Walls contained lakes of mucus-containing malignant epithelial and micro-glandular elements of carcinoma. It was suggested that the association between benign adenocarcinoma and mucous cystadenocarcinoma may represent an early developing phase. In addition, as the histological features of mucinous cystadenoma were identical to those of villous adenoma of the large intestine, the former disorder may represent the counterpart of villous adenoma within the appendix.

8799 BENIGN LYMPHOID POLYPS OF THE RECTUM. *(E.)* Weller, M. H.; Feldman, P. S. (Univ. California Medical Center, San Diego, Calif. 92103). *Pediatr. Radiol.* 3(4):209-212, 1975.

The case report of a seven-yr-old girl with multiple clustered polyps in the ano-rectal area is presented. The polyps were noted at proctosigmoidoscopy and confirmed by air contrast barium examination. At surgery, four groups of clustered polyps and two solitary polyps were removed from the rectum. Microscopic examination demonstrated lymphoid tissue, the main mass of which was submucosal. The muscularis mucosa was replaced and focally fragmented by lymphocytes. Focal ulceration of the mucosa was noted, with infiltration by many lymphocytes and a few plasma cells. The histologic diagnosis was benign lymphoid polyps. Although retention polyps are the single most common type of colonic polyp in children, the presence of multiple clustered polyps in the rectum should alert the radiologist to the possibility of benign lymphoid polyps. The differential diagnosis of lymphoid polyps should include retention juvenile polyps, familial polyposis, Peutz-Jehgers syndrome, adenomatous polyps, and lymphoid hyperplasia. Retention polyps are usually single, and when multiple are generally not clustered. Familial polyposis will usually show colonic involvement with many more lesions. Peutz-Jehgers polyps are accompanied by small intestine polyps and mucosal pigmentation about the lips and gingiva. Adenomatous polyps are rare in children and even more infrequently multiple. The lesions in lymphoid hyperplasia are not limited to the rectosigmoid area and may show central umbilication. The prognosis is uniformly good in cases of lymphoid polyps, with as yet no documented recurrence or malignant change.

8800 UNIQUE CASE OF MESENTERIC FIBROSIS IN MULTIPLE POLYPOSIS. *(E.)* Gold, R. S.; Mecha, S. J. (Naval Regional Medical Center, Phila., Pa.). *Am. J. Surg.* 130(3):366-369, 1975.

A case study was reported of a 44-yr-old man with mesenteric fibrosis and multiple polyposis. Semiannual follow-up examination for familial polyposis revealed several small polyps in the rectal stump remaining from a previous subtotal colectomy. Palpation of the right side of the abdomen revealed a mass, 10 x 7 x 4 in, extending from the right subcostal region to the semicircular line. Four polyps were removed. Medical history of family showed diabetes on the paternal side and extensive polyposis on the maternal side with seven deaths due to colon carcinoma. All clinical tests were negative except for an elevated blood sugar. Abdominal angiogram showed an avascular mass involving most of small intestine. A large solid ovoid tumor, 27 x 24 x 14 cm, was removed and a proximal jejunoterminal ileostomy was performed. Microscopic examination revealed mesenteric fibromatosis. Nine yr postcolectomy for familial polyposis, the patient was doing well with no evidence of anemia or liver dysfunction. Although this patient did not require long-term i.v. hyperalimentation, it may be suggested to prevent nutritional loss and to increase survival rate after a massive resection.

8801 THE PSEUDOMEMBRANOUS COLITIS ASSOCIATED WITH CLINDAMYCIN THERAPY--A VIRAL COLITIS. *(E.)* Steer, H. W. (Southampton General Hosp., Southampton, England). *Gut* 16(9):695-706, 1975.

Four patients (one woman and three men, aged 61-74 yr) are described who developed pseudomembranous colitis in association with clindamycin therapy (150-300 mg every six hr). Diarrhea occurred from seven to 25 days after initiation of clindamycin therapy, and was associated with pyrexia, tachycardia, episodes of relative hypotension, nonspecific abdominal pains, variable abdominal distension, and a polymorphonuclear leukocytosis. Stool cultures did not reveal any pathogenic bacteria. On sigmoidoscopy, the rectal mucosa was erythematous and its surface was covered with plaques of a creamy exudate. Rectal biopsies from two patients were studied under the electron microscope and compared with the ultrastructural appearance of the rectal mucosa from seven normal subjects. Colonic epithelial cells from the two patients contained virus-like particles about 50 nm in diameter and bound by a limiting membrane (7 nm thick). The particles were first observed in the supranuclear region of the colonic epithelial cells, were shed into the colonic lumen, and became related to the surface membranes of the colonic epithelial cells. Similar particles were present in large numbers in the pseudomembrane and in the endothelial cells of capillaries near the sites of colonic epithelial ulceration. Ultrastructural evidence for a viral colitis suggests that viral infection is responsible for epithelial ulceration, and results in the development of the pseudomembrane in colitis associated with clindamycin therapy.

8802 FAMILIAL PSEUDOMEMBRANOUS COLITIS AND ITS RELATION TO LINCOMYCIN THERAPY. *(E.)* Harrod, M. J. E.; Brown, M. S.; Weinberg, A. G.; Harkness, W. N.; Goldstein, J. L. (Univ. Texas Southwestern Medical Sch., 5323 Harry Hines Blvd., Dallas, Tex. 75235). *Am. J. Dig. Dis.* 20(9):808-812, 1975.

Severe pseudomembranous colitis was observed in three members of a single family: the father and two of his children, a 10-yr-old girl and a 17-yr-old boy. The father and the son had received the antibiotic lincomycin (300 or 600 mg, i.m.) prior to the onset of their symptoms. Death occurred seven days after the onset of illness in the boy and 16 days after the onset of illness in the girl. Although the disease in the daughter was apparently precipitated by intestinal obstruction, the autopsy findings were remarkably similar to those in her brother. Histological sections of the colon from the siblings showed pronounced hypersecretion, with an extensive pseudomembrane composed of mucus, fibrin, leukocytes, and bacteria overlying the mucosal surface. Foci of intense mucosal inflammation and necrosis were evident with increased numbers of plasma cells in the mucosa. In the father, proctoscopic findings of small yellowish plaques in association with abundant mucus secretion were compatible with a diagnosis of pseudomembranous colitis presumably related to lincomycin therapy. The occurrence of pseudomembranous colitis in three members of this family and the presence of colon disease in two other relatives (the father's sister and father) suggests that some common underlying genetic defect involving the colon might be responsible for the disease state in this family and, in addition, raises the possibility that antibiotic-induced pseudomembranous colitis in some patients may be the result of a pharmacogenetic interaction.

8803 A REAPPEARANCE OF ANTIBIOTIC-INDUCED PSEUDOMEMBRANOUS ENTEROCOLITIS. *(E.)* Tully, T. E.; Feinberg, S. B. (Veterans Admin. Hosp., Minneapolis, Minn.). *Radiology* 110(3):563-567, 1974.

Four cases of antibiotic-induced pseudomembranous enterocolitis are described. The cases involved a 68-yr-old man, a 43-yr-old man, a 54-yr-old woman, and an 80-yr-old woman, each of whom had been given lincomycin (600 mg, 3-4 times daily) or clindamycin (150 mg, 4 times daily). Explosive diarrhea, prostration, fever, abdominal distention, and/or rapid weight loss developed 1 to 4 days later. Proctoscopic findings included edematous mucosa with or without ulceration, and a dusky mucosa with a white pseudomembrane. Roentgenographic findings confirmed the pseudomembrane formation and showed thickening of the mucosal folds. Hyperalimentation and continued bowel rest were responsible for a gradual improvement in two patients, one of whom also received mycostatin; the other two patients died. Microscopically, the pseudomembrane in such cases consists of a mixture of necrotic cellular debris, fibrin, mucous, and a variable number of inflammatory cells which form as a result of fibrinoid necrosis of the superficial mucosa. Staphylococcal

infection, predisposing debilitating conditions, and antibiotic therapy may have etiologic significance. The diagnosis of pseudomembranous enterocolitis should be considered in any patient receiving antibiotics who suddenly experiences severe diarrhea, sudden dehydration, prostration with shock, and fever. The most definitive diagnostic procedure is proctoscopic examination. The basic treatment consists of bowel rest, discontinuing the offending antibiotics, institution of antistaphylococcal antibiotics, and treatment of shock and dehydration. Steroids, hyperalimentation, and changing the bowel flora may also be helpful. Despite vigorous treatment, the mortality rate ranges from 50 to 90%.

8804 THE IMPORTANCE OF BACTEROIDES AS A CAUSE OF SEVERE SEPSIS AFTER COLO-RECTAL SURGERY [abstract]. *(E.)* Keighley, M. R. B.; Burdon, D. W.; Slaney, G.; Cooke, W. T.; Alexander Williams, J. (Gen. Hosp., Birmingham, England). *Gut* 16(5):408, 1975.

8805 PROSTAGLANDINS IN HUMAN COLONIC CARCINOMA [abstract]. *(E.)* Bennett, A.; Del Tacca, M. (King's Coll. Hosp., London, England). *Gut* 16(5):409, 1975.

8806 APPENDICITIS AND DIETARY FIBRE [abstract]. *(E.)* Cove Smith, J. R.; Langman, M. J. S. (City Hosp., Nottingham, England). *Gut* 16(5):409, 1975.

8807 PROBLEMS OF A PERMANENT COLOSTOMY [abstract]. *(E.)* George, W. D.; Eardley, A.; Davis, F. N.; Schofield, P. F. (Univ. Hosp., South Manchester, England). *Gut* 16(5):408-409, 1975.

8808 COMPARATIVE EFFECTS OF CODEINE AND SENNA ON THE MOTOR ACTIVITY OF THE LEFT COLON [abstract]. *(E.)* Waller, S. L. (Cent. Middlesex Hosp., London, England). *Gut* 16(5):407-408, 1975.

8809 CHRONIC LESIONS OF RABBIT BOWEL DUE TO CONTACT WITH ANTISEPTIC SKIN PREPARATION [abstract]. *(E.)* Orr, M. M.; Tamarind, D. L.; Cook, J.; Fincham, W. J.; Hawley, P. R.; Quilliam, J. P.; Irving, M. H. (St. Bartholomew's Hosp., London, England). *Gut* 16(5):401, 1975.

8810 ORAL ELECTROLYTE LOAD FOR CLEANSING THE COLON [abstract]. *(E.)* Zvarqulis, J. E.; Williams, C.; Rhodes, J. B. (Univ. Kansas Med. Cent., Kansas City, Kans.). *Gastroenterology* 68(4):1062, 1975.

8811 PROCTALGIA FUGAX REVISISTED [abstract]. *(E.)* Panitch, N. M.; Schofferman, J. A. (Harbor Gen. Hosp., Torrance, Calif.). *Gastroenterology* 68(4):1061, 1975.

8812 PREDICTION OF LOCAL RECURRENCE AFTER ABDOMINO-PERINEAL RESECTION FOR CANCER OF THE RECTOSIGMOID [abstract]. *(E.)* Levin, B.; Moossa, A. R.; Ree, P. C.; Marks, J. E.; Platz, C. E.; Skinner, D. B. (Dept. Med., Univ. Chicago, Chicago, Ill.). *Gastroenterology* 68(4):1059, 1975.

8813 COLONOSCOPY WITHOUT FLUOROSCOPY [abstract]. *(E.)* Waye, J. D. (Mt. Sinai Sch. Med., New York, N.Y.). *Gastroenterology* 68(4):1051, 1975.

8814 THE VALUE OF COLONOSCOPY FOR THE DIAGNOSIS OF CROHN'S DISEASE [abstract]. *(E.)* Vantrappen, G.; Geboes, K. (Univ. Hosp. St. Rafael, Leuven, Belgium). *Gastroenterology* 68(4):1048, 1975.

8815 VALUE OF COLONOSCOPY IN ANTIBIOTIC-RELATED COLITIS [abstract]. *(E.)* Roseman, D. M.; Elliott, M. L. (Scripps Mem. Hosp., San Diego, Calif.). *Gastroenterology* 68(4):1045, 1975.

8816 INTERNAL STIFFENER AS AN AID TO COLOSCOPY WITH THE ACMI F9A COLOSCOPE [abstract]. *(E.)* Rogers, B. H. G. (Grant Hosp., Chicago, Ill.). *Gastroenterology* 68(4):1044, 1975.

8817 HEMANGIOMAS OF THE CECUM, GASTROINTESTINAL HEMORRHAGE AND CARDIOVASCULAR INSUFFICIENCY, A NEWLY RECOGNIZED SYNDROME [abstract]. *(E.)* Rogers, B. H. G.; Adler, F. (Grant Hosp., Chicago, Ill.). *Gastroenterology* 68(4):1044, 1975.

8818 TECHNIC OF COLONSCOPIC ELECTROSNARE EXCISION OF SESSILE POLYPOID TUMORS [abstract]. *(E.)* Rand, A. A. (Albert Einstein Coll. Med., Bronx, N.Y.). *Gastroenterology* 68(4):1043, 1975.

8819 ENDOSCOPIC MARKING OF COLONIC LESIONS [abstract]. *(E.)* Ponsky, J. L.; King, J. F. (Timken Mercy Hosp., Canton, Ohio). *Gastroenterology* 68(4):1041, 1975.

8820 RIGHT COLON HEMANGIOMAS AS CAUSE OF CHRONIC LOWER GASTRO-INTESTINAL HEMORRHAGE DEFINED BY FIBERCOLONOSCOPY [abstract]. *(E.)* Kleckner, F. S.; Khubchandani, I. T.; Stasik, J.; Leshock, L. (Sacred Heart Hosp. Cent., Allentown, Pa.). *Gastroenterology* 68(4):1036, 1975.

8821 ACUTE SUBHEPATIC APPENDICITIS. *(Rus.)* Kalugina, G. V. (Municipal Clinical Hosp. No. 67, Moscow, USSR). *Sov. Med.* (2):103-105, 1975.

8822 THE INFLUENCE OF EXPERIMENTAL INFLAMMATION OF THE APPENDIX ON IMMUNOGENESIS. *(Rus.)* Platash, V. I. (Dept. Pathoanatomy, Aktyubinsk Medical Inst., USSR). *Arkh. Patol.* 37(3):1-96, 1975.

8823 COLONOSCOPY (TECHNIQUE, INDICATIONS, RESULTS). *(Rus.)* Savelyev, V. S.; Buyanov, V. M.; Balalykin, A. S.; Voskresensky, P. K. (S. I. Spasokukotskiy Faculty Clinic Surgery, N. I. Pirogov Second Moscow Medical Inst., Moscow, USSR). *Khirurgiia (Mosk.)* (5):88-93, 1975.

8824 MANAGEMENT OF EXTERNAL NON-FORMED INTESTINAL FISTULAS IN CHILDREN. *(Rus.)* Vitsin, B. A.; Kolomiytsev, P. I.; Shapiro, G. D. (Hospital Clinic Surgery, Novosibirsk Region Clinical Hosp., Novosibirsk, USSR). *Khirurgiia (Mosk.)* (5):122-125, 1975.

8825 ANTIGEN DEGRADATION IN HUMAN COLON ECOSYSTEMS: AN EFFECT OF THE HOST OF ENTERIC BACTERIAL DEGRADATION OF THE BLOOD GROUP B-LIKE ANTIGEN ON E. coli [abstract]. *(E.)* Cromwell, C. L.; Hoskin, L. C. (VA Hosp., Cleveland, Ohio). *Gastroenterology* 68(4):916, 1975.

8826 RADIOGRAPHIC DEMONSTRATION OF RAT COLONIC TUMORS [abstract]. *(E.)* Gluckman, J.; Skucas, J.; Narisawa, T.; Turner, N. D. (Univ. Rochester Sch. Med., Rochester, N.Y.). *Gastroenterology* 68(4):901, 1975.

8827 THE NATURE OF HAEMORRHOIDS. *(Eng.)* Thomson, W. H. F. (Southampton General Hosp., Southampton, England). *Br. J. Surg.* 62(7): 542-552, 1975.

8828 CYSTIC INTESTINAL PNEUMATOSIS. *(It.)* Amoroso, L.; Anardi, V.; Marra, F.; Valitutti, P.; Crudele, G. (Ente Regionale Ospedaliero S. Giovanni di Dio e Ruggi d'Aragona, Salerno, Italy). *Chir. Gastroenterol.* 8(4):396-407, 1974.

8829 RECENT DATA ON THE RADIO-IMMUNOLOGICAL QUANTITY DETERMINATION OF THE CARCINO-EMBRYONIC ANTIGEN. *(Fr.)* von Kleist, S. (Institut de Recherches scientifiques sur le Cancer, 94800 Villejuif, France). *Bordeaux Med.* 8(6):677-680, 1975.

8830 ENTEROSPASM. *(Ger.)* Nikolov, P. N. (Medizinische Fakultat Sofia, Sofia, Bulgaria). *Radiol. Diagn. (Berl.)* 15(6):781-785, 1974.

8831 THE COMBINED APPEARANCE OF SPINAL-ANOMALIES AND DIVERTICLES OF COLON. *(Ger.)* Mollers, I.; Zimmermann, W. (Krankenhaus fur Naturheilweisen, 8 Munchen-Harlaching, Sanatoriumsplatz 2, Germany). *Med. Klin.* 70(17):766-770, 1975.

8832 X-RAY CONTROL IN BLEEDING OF THE LARGE INTESTINE. *(Ger.)* Cen, M. (Abteilung Radiologic, Knappschaftskrankenhauses Wurselen-Bardenberg, Germany). *Diagnostik* 8(2):59-61, 1975.

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8834 RADIATION COLITIS. INTEREST OF MESENTERIC ANGIOGRAPHY. *(Fr.)* Verwaerde, J. V.; Gignoux, M.; Humeau, F.; Rousselot, P.; Valla, A. (Service de Gastroenterologie, C. H. U., avenue G.-Clemenceau, F 14033 Caen, France). *Arch. Fr. Mal. App. Dig.* 64(1):53-57, 1975.

8835 NEOPLASTIC SIGMOIDO-JEJUNO-COLIC FISTULA. *(Fr.)* Berutti, A.; Bohuard, J.; de Saint-Julien, J.; Pupee, J. C. (Hopital d'Instruction des Armees, Sainte Anne, 83000, Toulon, France). *Chirurgie* 101(4):243-244, 1975.

8836 INDICATIONS FOR FIBEROPTIC COLONOSCOPY. *(Eng.)* Christie, J. P.; Shinya, H. (Beth-Israel Medical Center, New York, N. Y.). *South Med. J.* 68(7):881-886, 1975.

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8838 X-RAY DIAGNOSIS OF LARGE INTESTINE POLYPS BY THE GYROSCOPIC TV. *(Jpn.)* Sasaki, T. Maruyama, M.; Funada, A.; Baba, Y.; Sugiyama, N.; Takekoshi, T.; Takagai, K.; Endo, T.; Nakamura, K.; Kumakura, K. (Cancer Institute Hosp., Japan). *Rinsho Hoshansen* 20(3):195-202, 1975.

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8841 NUCLEAR MORPHOLOGY IN NEGATIVE AND FALSE-NEGATIVE RECTAL BIOPSIES. *(It.)* Rilke, F.; Clemente, C.; Pilotti, S. (Istituto Nazionale Studio Cura Tumori, Milan, Italy). *Tumori* 61(2):199-209, 1975.

8842 SOME LEUKOCYTE ENZYME ACTIVITIES IN ACUTE APPENDICITIS IN CHILDREN. *(Rus.)* Generalov, A. I.; Komissarova, I. A.; Kalashnikova, O. A. (Moscow Res. Inst. Pediatric Surgery, USSR). *Vopr. Okhr. Materin. Det.* 20(6):85-86, 1975.

8843 APPENDICITIS IN RELATION TO GYNECOLOGICAL AND OBSTETRICAL POCESSES. (BIOGRAPHIES OF JOHN BENJAMIN MURPHY AND CHARLES McBURNEY). *(Sp.)* Sanchez Arcas, R. (No affiliation given). *Toko-Ginecol. Pract.* 33(358):235-242, 1975.

8844 IDENTIFICATION OF A NEW ONCO-FOETAL ANTIGEN EXTRACTED FROM HUMAN COLON CARCINOMA [abstract]. *(Eng.)* Fritsche, R.; Mach, J. P. (Institut de biochimie, Universite de Lausanne, CH-1011, Lausanne, Switzerland). *Experientia* 31(6):719, 1975.

8845 ACUTE ISCHEMIA OF THE LEFT HALF OF THE LARGE INTESTINE FOLLOWING RECONSTRUCTION OF THE AORTA AND ILIAC ARTERY. *(Rus.)* Peregudov, I. G.; Lebedev, L. V. (S. M. Kirov Military Medical Acad., Leningrad, USSR). *Vestn. Khir.* 114(5):130-131, 1975.

8846 TRIAL OF COLOTEN IN DISEASES OF THE COLON: 40 CASES. *(Fr.)* Tabbane, S. (Hospital Charles-Nicolle, Tunis, Tunisia). *Med. Chir. Dig.* 3(5):357-359, 1974.

8847 SPIROCHETES IN THE INTESTINAL MUCOSA. *(Rus.)* Voino-Iasenetskii, M. V.; Snigirevskaia, E. S.; Belianin, V. L. (Inst. Experimental Medicine, Leningrad, USSR). *Arkh. Patol.* 37(5):34-40, 1975.

8848 GASTROINTESTINAL MANIFESTATIONS OF ENDOMETRIOSIS: 63 CASES. *(Fr.)* Rochet, Y.; Lansac, J.; Drogou, F. (Clinique Gynecologique, Universite Claude-Bernard, Hopital Eduoard-Herriot, 69734 Lyon Cedex 2, France). *Lyon Chir.* 71(4):247-252, 1975.

8849 TRIAL OF PRIFNIUM BROMIDE TO TREAT DISEASE OF THE COLON. *(Fr.)* Baillet, J.; Marti, R. (C.H.U., 80000 Amiens, France). *Sem. Hop. Ther.* 51 (2):95-97, 1975.

8850 CANCER OF THE COLON: IMMUNOLOGIC APPROACH TO DIAGNOSIS. *(E.)* Pollard, H.M.; Molnar, I. G. (Dept. Internal Medicine, Univ. Michigan, Ann Arbor, Mich. 48104). *Univ. Mich. Med. Cent. J.* 40 (2):62-66, 1975.

8851 ULCERATIVE NECROTIZING ENTEROCOLITIS IN PREMATURE INFANTS. *(It.)* Beau, A. (Faculte Medecine, Nancy, France). *Bull. Soc. Med. Afr. Noire Lang. Fr.* 22(3):217-219, 1975.

8852 INTESTINAL INTUSSUSCEPTION WITH SUBTOTAL COLONIC RESECTION. *(Sp.)* Ollero Caprani, J. M.; Rollan Villamarin, V. (Hospital Nino Jesus, Madrid, Spain). *Acta Pediatr. Esp.* 33(388):125-130, 1975.

See also, 8017, 8056, 8297, 8379, 8402, 8406, 8411, 8417, 8433, 8436, 8465, 8469, 8488, 8499, 8574, 8644, 8697, 8703, 8721, 8724, 8725, 8726, 8729, 8736, 8859, 8862, 8867, 8891, 8915, 8972, 9393, 9396, 9397.

LARGE INTESTINE

Ulcerative Colitis

8853 THE LATE STAGE OF ULCERATIVE COLITIS: A LONG-TERM RADIOLOGICAL FOLLOW-UP. *(Ger.)* Burgener, F. A. (Dept. Radiology, Univ. Rochester, N.Y.). *Fortschr. Geb. Roentgenstr. Nuklearmed.* 121 (6):761-767, 1974.

Results are presented for radiological followups lasting 5 to 33 yr on 16 patients (7 men and 9 women, aged 20-68 yr) with histologically confirmed ulcerative colitis. All of these patients had (1) been asymptomatic for at least one yr, (2) radiological evidence of complete or partial involvement of the colon but no signs of ulcerations or pseudopolyps, and (3) no history of colectomy and no colectomy performed during the first five yr of follow-up. Of these 16 patients, three eventually underwent partial colectomy: two for carcinoma after 8 and 32 yr, resp., and one for benign rectosigmoid stenosis. Except for increases in the presacral space in three cases, eight patients in the late stages of ulcerative colitis had no evidence of changes on barium enema examinations. However, only four of these eight patients were asymptomatic. In three patients, further shrinkage of the affected colon occurred; in one case, this was accompanied by the development of rectosigmoid stenosis. In the remaining five patients, radiological changes characteristic of ulcerative colitis had regressed significantly, so that the colon gradually returned to an almost normal length and diameter. Haustration reappeared, as did the mucosal relief, in all five cases; however, the latter was abnormally coarse. Some of these patients developed complications which included recurrence of ulcerations and pseudopolyps (3 cases) and one case each of rectal and cecal carcinoma. One yr after successful tumor resection and ileocolostomy, the latter patient had a recurrence of acute ulcerative colitis in the remaining colon and the anastomosis. It is concluded that there is no such thing as "burnt-out" colitis since changes continue to occur in radiological findings.

8854 SELECTIVE IMMUNOGLOBULIN A DEFICIENCY, ULCERATIVE COLITIS, AND GLUTEN-SENSITIVE ENTEROPATHY — A UNIQUE ASSOCIATION. *(E.)* Falchuk, K. R.; Falchuk, Z. M. (Dept. Medicine, Massachusetts General Hosp., Boston, Mass.). *Gastroenterology* 69(2):503-506, 1975.

A case of selective IgA deficiency, malabsorption, gluten-sensitive enteropathy (celiac sprue), and ulcerative colitis is reported. A 47-yr-old Caucasian woman was hospitalized with a 14-yr history of intermittent watery diarrhea and a weight loss of 34 lb over the preceding eight weeks. One yr earlier, steatorrhea, thought to be secondary to gluten-sensitive enteropathy, was diagnosed. Gluten restriction was associated with weight gain, improved intestinal absorption, and decreased steatorrhea and diarrhea. Abdominal examination at the present hospitalization revealed epigastric and umbilical tenderness without guarding or rebound. Sigmoidoscopy demonstrated an edematous and friable rectal mucosa with ulcerations, and a barium enema revealed a colon without haustral markings. Colonoscopy confirmed the presence of active colitis and biopsies confirmed the presence of mucosal lesion with crypt abscesses. A jejunal biopsy showed flat mucosa with some loss of nuclear polarity, vacuolization of the surface epithelial cells, and infiltration of the lamina propria with increased numbers of plasma cells and lymphocytes. The patient gained weight on a strict gluten-free diet with p.o. iron, but the abdominal pain and diarrhea failed to respond, even when prednisone was added. The patient was rehospitalized five months later with recurrent weight loss and persistent diarrhea. Immunoelectrophoresis confirmed the absence of serum IgA. The jejunal mucosal architecture showed improvement and all brush border enzymes except lactase showed normal activity. A total proctocolectomy was performed and the histopathology confirmed the presence of active colitis with numerous ulcers and microabscesses. The patient has since done well on a gluten-free diet. Histocompatibility antigen typing revealed her phenotype as 1,8. The occurrence of immunoglobulin A deficiency in a patient with ulcerative colitis and gluten-sensitive enteropathy is uncommon.

8855 DISEASE ACTIVITY AND SERUM PROTEINS IN ULCERATIVE COLITIS: IMMUNOCHEMICAL QUANTITATION. *(E.)* Marner, I. L.; Friborg, S.; Simonsen, E. (Dept. Medical Gastroenterology, Odense Sygehus, Odense, Denmark). *Scand. J. Gastroenterol.* 10(5): 537-544, 1975.

The relation between the immunoelectrophoretical quantitation of serum proteins and the clinical activity of patients with ulcerative colitis was studied. Fifty patients (33 women and 17 men, aged 10-72 yr; mean age 35 yr) were studied. Twenty-six of these patients (21 women and 5 men) were suffering from ulcerative colitis in various stages. The ten serum proteins analyzed by cross-immunoelectrophoresis were: pre-albumin, orosomucoid, haptoglobin, ceruloplasmin, α_2-macroglobulin, transferrin, IgA, IgG, IgM and β-lipoprotein. The clinical conditions were classified into five basic groups: active febrile, active afebrile, unstable, remission, and restitution. Ceruloplasmin remained unchanged at 0.4 g/l upon reaching the unstable/remission period. The levels of α_2-macroglobulin, pre-albumin and transferrin all significantly increased in the active febrile/active afebrile and active afebrile/unstable conditions. Haptoglobin and orosomucoid levels decreased (from 6.5 to 2.0 g/l and 3.4 to 0.8 g/l, resp.) with decreasing clinical severity. There were no significant changes in IgA, IgG or IgM levels throughout the clinical course. The observed changes in serum protein patterns during the course and treatment of ulcerative colitis might prove important with respect to daily observations of the clinical condition. The serum protein levels of orosomucoid and haptoglobin were the most indicative of the clinical condition. The level of pre-albumin may be valuable in severely ill patients when treatment change is warranted.

8856 ASSESSMENT OF SEVERITY IN COLITIS: A PRELIMINARY STUDY. *(E.)* Lennard-Jones, J. E.; Ritchie, J. K.; Hilder, W.; Spicer, C. C. (St. Mark's Hosp., City Road, London ECIV 2PS, England). *Gut* 16(8):579-584, 1975.

A classification system for the severity of acute colitis was constructed by correlating the clinical features, noted soon after admission, of patients with the success of drug treatment or the need for emergency surgery. Data was collected from 181 admissions to one hospital during a five-year period, and the clinical features were analyzed singularly, or in combinations of up to five. The success of the treatment regimens was determined by the death rate during treatment. Many of the 56 clinical features studied were of no value in predicting the outcome of the attack. The four features of greatest predictive value were maximum daily body temperature, maximum daily pulse rate, bowel frequency and plasma albumin. The simplest and most discriminating prediction at the end of the first 24 hr was obtained by combining observations of maximum body temperature and the number of stools passed. A patient who passed less than eight stools on the first day and had a maximum body temperature less than 38 C had a high probability of responding to medical treatment. Conversely, if both values were elevated, the probability of successful medical treatment was only one in five. Serial observations of temperature or pulse rate over the first four days gave more prognostic information than observations confined to the first day. A patient with a maximum temperature greater than 38 C on the fourth day had about one chance in eight of responding to medical treatment. In this series, medical treatment failed in 37 cases; there were four deaths, one during medical treatment and three after urgent surgical treatment. An additional eight patients underwent immediate surgical treatment when abdominal radiography revealed colonic dilation and mucosal islands; no analysis of the prognostic value of other clinical features was possible in this group. A simple classification of severity in acute colitis is proposed from these results as a basis for prospective testing in other hospitals.

8857 A CONTROLLED TRIAL OF AZATHIOPRINE IN THE MANAGEMENT OF CHRONIC ULCERATIVE COLITIS. *(E.)* Rosenberg, J. L.; Wall, A. J.; Levin, B.; Binder, H. J.; Kirsner, J. B. (Section of Gastroenterology, Univ. Chicago, 940 E. 59th St., Chicago, Ill. 60637). *Gastroenterology* 69(1):96-99, 1975.

A double-blind, controlled outpatient trial of azathioprine was performed in 30 patients with chronic, nonspecific ulcerative colitis. The subjects were randomized into placebo- (14) or drug-treatment (16 patients, 1.5 mg/kg/day) groups. All other medication was discontinued with the exception of prednisone. Patients were observed for possible drug toxicity, general health and bowel habits. Proctosigmoidoscopy and rectal biopsies were also performed. Comparison of the mean scores for the number of bowel movements/day, the state of health and endoscopic and biopsy findings for the first and last 3 wk, and for the first and last 3 mo of the study showed no significant differences either within the same group or between groups. A definite trend toward improvement in x-ray could not be determined after azathioprine administration. Prednisone was discontinued in seven patients in the azathioprine group compared with one in the placebo group, a significant difference. The average reduction in steroid dosage in the drug-treatment group at the end of the trial (-11.5 mg/day) was significantly greater than in the placebo group (-6.1 mg/day). No adverse side effects were seen. Follow-up within 2 months after discontinuation of both drugs showed that four patients in the azathioprine group relapsed, including one who developed a toxic megacolon, compared to none in the placebo group. These results suggest that the addition of azathioprine to the treatment regimen of patients with chronic, nonspecific ulcerative colitis who require steroids may permit significant reductions in steroid dosage without worsening of the disease.

8858 SERIAL CEA TITERS AND ULCERATIVE COLITIS [abstract]. *(E.)* Gardner, R. C.; Feinerman, A. E.; Kantrolitz, P. A.; Zamcheck, N. (Boston City Hosp., Boston, Mass.). *Gastroenterology* 68(4): 897, 1975.

8859 PROSPECTIVE EVALUATION OF THE RESULTS OF SURGERY IN CHILDREN WITH INFLAMMATORY DISEASE OF COLON [abstract]. *(E.)* Fierst, S. M. (Brooklyn-Cumberland Med. Cent., N.Y.). *Gastroenterology* 68(4):892, 1975.

8860 FALLING CIRCULATING CEA LEVELS DESPITE SEVERE PROGRESSIVE ACUTE ULCERATIVE COLITIS: A POOR PROGNOSTIC SIGN [abstract]. *(E.)* Feinerman, A. E.; Gardner, R. C.; Gootblatt, S.; Kantrowitz, P.; Zamcheck, N. (Boston City Hosp., Boston, Mass.). *Gastroenterology* 68(4):891, 1975.

8861 THE PMN LEUCOCYTE AND COLONIC EPITHELIAL CELL IN ULCERATIVE COLITIS [abstract]. *(E.)* Dobbins, W. O.; Hoxter, R. (George Washington Univ. Med. Cent., Washington, D.C.). *Gastroenterology* 68 (4):884, 1975.

8862 EFFECTS OF HYPERTONIC ENEMAS ON THE RECTAL MUCOSA [abstract]. *(E.)* Devroede, G.; Leriche, M.; Sanchez, G.; Rossano, J. (Centre Hospitalier Univ., Sherbrooke, Quebec, Canada). *Gastroenterology* 68(4):882, 1975.

See also, 8411, 9004, 9183, 9319, 9334, 9370, 9399, 9402, 9403, 9404, 9407, 9408, 9410, 9412, 9413.

PANCREAS

8863 PROPORTIONAL MORTALITY AMONG ALCOHOLICS. *(E.)* Monson, R. R.; Lyon, J. L. (Harvard Sch. Public Health, 677 Huntington Ave., Boston, Mass. 02115). *Cancer* 36(3):1077-1079, 1975.

A cohort mortality study of 1139 male and 243 female chronic alcoholics was performed to test the hypothesis that there is a positive association between chronic alcoholism and carcinoma of the pancreas. The mortality rate among these subjects was compared with that expected on the basis of U.S. rates. Among the 894 subjects who died, a proportional mortality ratio (PMR) of greater than one was observed for tuberculosis, alcoholism, epilepsy, pneumonia, gastric or duodenal ulcer, and cirrhosis. The absolute risk of death due to diseases of the circulatory system, respiratory disease other than pneumonia, suicide, and other external causes also appeared to be increased among alcoholics. The lowest PMR (0.2) was associated with infectious diseases other than pneumonia, the next lowest PMRs being associated with vascular lesions of the central nervous system (0.6) and all other causes (0.5). Based on a comparison of proportional cancer mortality for various sites, there was no evidence that cancer of the pancreas occurs with excess frequency among alcoholics; three deaths were observed, and 5.1 were expected. The largest ratios were seen for cancer of the larynx, buccal cavity and pharynx, esophagus, and lung. Thus, it appears that there is no association between alcohol consumption and cancer of the pancreas; likewise, there was no support for an association between alcohol consumption and cancer of the prostate.

8864 PATHOLOGICAL AND RADIOLOGICAL STUDY OF THE PANCREATIC DUCTS FROM A FUNCTIONAL POINT OF VIEW. *(Fr.)* Borelly, J.; Fays, J.; Bonhomme, J. C.; Mangin, C.; Cayotte, J. L. (U.E.R. Medicale A, 30 rue Lionnois, F. 54019 Nancy, France). *Arch. Anat. Pathol. (Paris)* 22(4):253-259, 1974.

In 170 adult subjects free from lesions of the bilio-pancreatic sphere, duodenopancreatic blocs were removed at autopsy; 139 of these were kept to study the functional value of the Santorini (S.) duct. Radiological, anatomical and histological studies were performed as well as moldings (49) of the communicating duct and the bilio-pancreatic junction. Thirty-seven cases where the S. duct was functional were investigated from two points of view: (1) the morphological aspect of the S. duct in either a minor or major role, and (2) the functional aspect, when there is communication between the S. duct and the duct of Wirsung (W.), or when there is no such communication. An important discovery was that in females the distribution was closest to the embryological disposition, while in males the distribution was such that the S. duct could supplement an obstructed W. duct at the level of the bilio-pancreatic junction. Histological study of the caruncules revealed the importance of the sphincter of Oddi, the thickening of which coincided with flattened ducts. It is concluded that there is a correlation between the method of opening of Oddi's sphincter and the degree of permeability of the S. duct.

8865 HISTOCHEMICAL STUDIES OF PANCREATIC CALCULI. *(E.)* Takahashi, W.; Matsushiro, T.; Suzuki, N.; Sato, T. (Tohoku Univ. Sch. Medicine, Sendai, Japan). *Tohoku J. Exp. Med.* 116(1):1-8, 1975.

Histochemical and mineralogical analyses of surgically removed pancreatic calculi were performed in order to determine their composition and pathogenesis. Fourteen pancreatic calculi obtained from pancreatic lithiasis patients at surgery were analyzed by infrared spectrophotometry and, following decalcification, were fixed, sectioned, stained and studied microscopically. Infrared spectra showed 13 stones to be calcium carbonate and one to be calcium phosphate. Decalcification of the calcium carbonate stones was complete by 30 hr, but the calcium phosphate stone required 24 days for completion. The calcium carbonate stones stained positively with alcian Blue at a pH of 2.4 but not at 1.0. By the Scott-Dorling method, alcianophilia was seen with 0.1 M $MgCl_2$ but not with 0.2 M $MgCl_2$. Beta-metachromicity was seen with toluidine blue, and all of the calcium carbonate calculi were positive to colloidal iron but only weakly positive to PAS. Calcium phosphate calculi responded to Bieschowskys' silver impregnation. The staining characteristics of the calcium phosphate calculi indicated that a major portion of the matrix was composed of collagen fibers, while the characteristics of the calcium carbonate calculi indicated a reticular organic matrix. The carbonate stones were formed with matrices of reticulated mucosubstances suggestive of acidic glycoprotein, and all of these stones were found intraductally. Calcium phosphate stones showed a fibrillar structure, suggesting degenerating collagen fibrils and indicating pathologic calcification of parenchyma. The results infer that different mechanisms are involved in the development of each type of calculus.

8866 PANCREATIC ASCITES: THE ROLE OF ENDOSCOPIC PANCREATOGRAPHY. *(E.)* Davis, R. E.; Graham, D. Y. (Baylor Coll. Medicine, 1200 Moursund Ave., Houston, Tex. 77025). *Am. J. Dig. Dis.* 20(10): 977-980, 1975.

Endoscopic retrograde cholangiopancreatography (ERCP) was used to demonstrate a pancreatic pseudocyst in a patient with pancreatic ascites. A 54-yr-old woman was hospitalized with a three-month history of weight loss and a one-month history of increasing abdominal girth and ankle swelling. The patient was chronically ill with muscle wasting of the upper proximal muscle groups. Abdominal examination revealed massive ascites. Paracentesis revealed a clear yellow fluid with a protein content of 3.8 g/dl. Ascitic fluid amylase was 24,480 Somogyi units, lipase was 24.8 units, and the WBC count was 45 cells/mm^3. Peritoneal biopsy demonstrated fibrosis and mesothelial cell hyperplasia. Upper gastrointestinal barium study was normal. Sixteen days after admission, the patient underwent a ERCP using a contrast material mixture of Renografin 60 (40 ml) and gentamicin sulfate (2 ml). The material was injected directly into the pancreatic duct. When the contrast material was seen to extravasate, the injection was terminated. The patient had an uneventful recovery but died six days later due to massive bilateral pulmonary emboli. Postmortem examination revealed a small pancreatic pseudocyst adherent to the posterior wall of the stomach. This case demonstrated the value of ERCP in the preoperative identification of the area of pancreatic duct disruption in patients with pancreatic ascites.

8867 MEDIAL CECAL DEFECT ASSOCIATED WITH METASTATIC PANCREATIC CARCINOMA. *(E.)* Joffe, N. (Beth Israel Hosp. and Harvard Medical Sch., Boston, Mass.). *Radiology* 111(2):297-300, 1974.

The roentgenologic findings in seven patients with a medial extrinsic pressure cecal deformity associated with metastatic pancreatic carcinoma are discussed. One patient had symptoms and signs of intestinal obstruction, while six patients presented with nonspecific abdominal complaints. Of those six, one had a palpable mass, one had ascites, and four had no positive clinical findings. Barium studies performed on six of the seven patients exhibited a similar roentgenologic abnormality, i.e., a localized defect on the medial aspect of the cecum below the ileocecal junction. The cecal mucosa was intact, and small bowel studies were generally normal; barium filling of the appendix was not observed in four patients. The surgical or autopsy findings in all seven cases were similar. There was a primary carcinoma of the pancreas with a prominent metastatic mass in the right lower quadrant adhereat to the medial portion of the cecum. In addition, scattered small metastases of the liver, omentum, or peritoneum, and some free i.p. fluid were noted. The association of the primary pancreatic carcinoma with a prominent right lower quadrant mass was suggested to be related to two common modes of pancreatic carcinoma, *via* the mesenteric reflections or by means of i.p. seeding.

8868 ASPIRATION BIOPSY OF CARCINOMA OF THE PANCREAS. *(E.)* Shorey, B. A. (Royal Infirmary, Bristol, England). *Gut* 16(8):645-647, 1975.

Peroperative pancreatic aspiration biopsy was evaluated in 21 patients with pancreatic lesions. The biopsies were performed using a standard 20-ml disposable syringe and a 21-gauge needle. Needle aspirations of the pancreas were also performed on ten postmortem specimens. Of the 21 cases in which biopsies were taken preoperatively, 18 showed malignant cells and in all cases the diagnosis was confirmed either by standard biopsy or at necropsy. Three cases showed no malignancy and subsequent follow-up confirmed its absence in the pancreas. Of the ten cases in which biopsies were performed at necropsy, malignant cells were found in six: four cases were confirmed by metastatic deposits, one was confirmed by further histology, and one was found to be a carcinoma of the stomach which had spread to involve the pancreas. No malignancy was found in the other four cases. The diagnosis of malignancy was made on the basis of irregularity in size, shape, and density of the nuclei, high nuclear cytoplasmic ratio, irregular and large nucleoli, and dense chromatin pattern. The only complication in the series was in a patient who was deeply jaundiced and in whom the jaundice spread to the liver. It is concluded that peroperative pancreatic needle biopsy is a safe and easily performed procedure. It can be of enormous value to the surgeon in planning the treatment of patients with pancreatic lesions and in cases where there is an operable mass in the pancreas. It offers a simple and quick method of determining the presence of malignant cells. In the latter case, definitive surgery may then be performed with confidence. For the inoperable cases, it offers a method of histological confirmation of the operative findings.

8869 ROENTGEN DETECTION OF ENLARGEMENT OF THE BODY AND TAIL OF THE PANCREAS USING THE SUPINE TRANSLATERAL PROJECTION. *(E.)* Seaman, W. B.; Sorabella, P. A.; Campbell, W. L. (Columbia-Presbyterian Medical Center, New York, N.Y.). *Radiology* 111(3):529-533, 1974.

A new method for the detection of enlargement of the body and tail of the pancreas, employing a lateral film using a horizontal beam and a supine patient position, is described. Exposures were made in both full inspiration and full expiration. Three case reports were discussed. In a 45-yr-old man with diagnosed acute pancreatitis, translateral radiographs revealed striking separation of the ligament of Treitz from the gastric fundus, indicating marked enlargement of the pancreatic body and tail. Frontal projections of the duodenal circle were normal, and decubitus laterals were unrevealing. A 58-yr-old woman with known pancreatic disease showed a marked separation of the gastric fundus and the duodeno-jejunal junction in the translateral projection. However, potential misinterpretation of the lateral film was also revealed. Translateral radiographs of a 71-yr-old woman with recurrent acute pancreatitis showed abnormal widening of the space between the gastric fundus and the ligament of Treitz, suggesting pancreatitis. A subsequent radiograph lacked such widening, as well as the localized indentation of the posterior stomach wall previously observed. While the localized indentation is considered a reliable clue to the presence of a retrogastric mass, it cannot reflect the actual size of the lesion. Problems encountered in the interpretation of the translateral technique include the absence of the triangular space between the ligament of Treitz in some patients, the nonparallel long pancreatic axis in the supine patient, and the occasional difficult identification of the ligament of Treitz. However, having been used in over 100 patients, the technique is considered a useful adjunct in suspected pancreatic disease.

8870 THE AXIAL PANCREATIC VIEW: A NEW APPROACH FOR RECOGNIZING ENLARGEMENT OF THE BODY AND TAIL OF THE PANCREAS. *(E.)* Sorabella, P. A.; Campbell, W. L.; Seaman, W. B. (Columbia-Presbyterian Medical Center, New York, N. Y. 10032). *Radiology* 111(3):535-542, 1974.

The technique of employing an axial pancreatic view for detecting enlargement of the pancreatic body and tail is described. The orientation and relationship of the pancreatic body-tail was visualized *via* roentgenographic cadaver experiments, and the axial pancreatic view was developed. Following p.o. administration of 8 oz of barium, the technique consists of placing the patient supine with the left side against a vertical cassette, displacing the foot of the X-ray table at a 25 degree angle, and elevating the left side 20 degrees. A horizontal beam is then directed perpendicularly to the cassette, hence aligned with the long axis of the pancreas. Using the technique, the pancreatic body-tail space was noted to be pathologically enlarged if it could contain a circle 3.5 cm in diameter. The first and second portions of the duodenum were projected posterior to the ligament of Treitz and the posterior gastric wall; hence simplifying identification of the ligament of Treitz. Illustrative clinical case studies demonstrated use of the axial pancreatic view in revealing otherwise obscured large local impressions on the posterior gastric wall and quantitative enlargement of the pancreas. This technique is suggested to be a useful pathological adjunct.

8871 EXOCRINE PANCREATIC FUNCTION AFTER UPPER ABDOMINAL SURGERY. *(E.)* Suda, Y.; Shiraso, M.; Sato, T. (Tohoku Univ. Sch. Medicine, Sendai, Japan). *Tohoku J. Exp. Med.* 115:307-317, 1975.

The exocrine functions of 15 patients who underwent abdominal surgery of several types with external pancreatic duct drainage were compared before and after surgery. Effects of pancreatic or gastric resection and pancreatic fibrosis on the exocrine pancreatic function were studied by histometrical treatment of the tissue and quantitative measurement of pure pancreatic juice. Six patients (5 men and 1 woman, aged 26-52 yr) who underwent cholecystectomy (1 patient)

and/or gastrectomy were diagnosed as having cholecystolithiasis and chronic pancreatitis (1), gastric cancer (4) and membranous mucosal folding of the duodenum (1). Five patients (4 men and 1 woman, aged 44-64 yr) who underwent pancreatoduodenectomy were diagnosed as having localized pancreatitis of the head of the pancreas (1), insulinoma of the head of the pancreas (1), cancer of the common bile duct (2) and cancer of the head of the pancreas (1). The daily flow of pancreatic juice in four controls was 833.9 to 958.5 ml. Patients with diverted duodenum showed 60 to 70% depressions in pancreatic secretion when compared to patients with different anastomotic types after subtotal gastrectomy. The difference in secretory response between Billroth I and II gastrectomies was due to the lack in the endogenous duodenal stimulation caused by the diversion of gastric contents. After pancreatoduodenectomy, the secretory depressions in the pancreatic remnant without fibrosis were 31.7% in pancreatic flow, 19.1% in bicarbonate and 11.3% in enzyme output against the control; exocrine pancreatic secretion was depressed beyond the expected value. In two cases of total gastrectomy with the same reconstructive anastomosis, the decreases in pancreatic secretion were about the same as the parenchymal reduction (40%). As the pancreas parenchyma without microscopical lesion occupied 90.47 to 93.97% of the total organ, a pancreas with over 90% parenchyma might be considered functionally normal. The fibrotic pancreas with 70.95% of parenchymal ratio showed a corresponding decrease in the flow of juice and in outputs of bicarbonate and amylase. Exogenous stimulation of secretion with secretin or pancreozymin suggest that the secretory output is affected by the histological changes and the volume of pancreas remnant. The percent increase in enzyme secretion under pancreozymin stimulation was much higher in the nonresected pancreas than in the pancreatoduodenectomized organ.

8872 INCREASE IN URINARY INDICAN EXCRETION IN PANCREATIC STEATORRHOEA FOLLOWING REPLACEMENT THERAPY. *(E.)* Miloszewski, K.; Kelleher, J.; Walker, B. E.; Davies, T.; Smith, C. L.; Losowsky, M. S. (Saint James Hosp., Leeds, England). *Scand. J. Gastroenterol.* 10(5):481-485, 1975.

Urinary indican excretion was studied in five patients with severe steatorrhea of pancreatic origin, in four patients with steatorrhea unrelated to pancreatic insufficiency, and in five normal volunteers. Pancreatic replacement therapy was given *via* 18 Pancrex-V capsules/day. Feces were collected, chromium sesquioxide was used as a continuous fecal marker, and fecal fat was estimated. Urinary indican was measured in 24-hr samples, and considerable variation was noted. In all five patients with steatorrhea of pancreatic origin, indican excretion was found to be in the low normal range initially (10-40 mg/24 hr), then rose significantly to 110 to 220 mg/24 hr. This occurred concurrently with the fall in fecal fat in response to pancreatic replacement therapy. After continuous replacement therapy for 10 to 12 months, indican excretion generally decreased to normal. Pancrex administration plus a low protein diet produced only a small rise in urinary indican excretion, which rose slowly upon reverting to 100 g of daily protein intake. No significant change in indican or fecal fat excretion occurred after pancreatic enzyme therapy in patients with steatorrhea due to causes other than pancreatic insufficiency; minor rises of 10 to 70 mg/24 hr were noted in 80% of the normal subjects. The low indican excretion in pancreatic steatorrhea was assumed to result from inadequate protein digestion. A rise in indican excretion above normal in response to pancreatic therapy seemed specific for steatorrhea of pancreatic origin, and is suggested to be a useful diagnostic test.

8873 ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP) AND PURE PANCREATIC JUICE CYTOLOGY: A COMBINED DIAGNOSTIC APPROACH IN PANCREATIC DISEASE [abstract]. *(E.)* Hatfield, A. R. W.; Smithies, A.; Wilkins, R.; Levi, A. J. (Northwick Park Hosp., Middlesex, England). *Gut* 16(5):405, 1975.

8874 PANCREATIC DIAGNOSIS: COMPARISON OF ENDOSCOPIC PANCREATOGRAPHY (ERCP), ISOTOPE SCANNING, AND SECRETIN TESTS IN 62 PATIENTS [abstract]. *(E.)* Cotton, P. B.; Ponder, B. A. J.; Beales, J. S. M.; Croft, D. N. (Middlesex Hosp., London, England). *Gut* 16(5):405, 1975.

8875 ANTIBODIES REACTING WITH HUMAN EXOCRINE PANCREAS [abstract]. *(E.)* Lendrum, R.; Walker, G. (St. Mary's Hosp., London, England). *Gut* 16(5):405, 1975.

8876 PANCREATIC REGENERATION FOLLOWING SURGICAL RESECTION [abstract]. *(E.)* Pearson, K. W.; Scott, D.; Torrance, H. B. (Manchester R. Infirm., Manchester, England). *Gut* 16(5):405, 1975.

8877 VASOACTIVE INTESTINAL PEPTIDE AND THE VERNER-MORRISON SYNDROME [abstract]. *(E.)* Bloom, S. R. (R. Postgrad. Med. Sch., London, England). *Gut* 16(5):399, 1975.

8878 CHEMICAL COMPOSITION OF PANCREATIC STONES [abstract]. *(E.)* Verine, H. J. (Hosp. Ed. Herriot, Lyon, France). *Gastroenterology* 68(4): 1065, 1975.

8879 COMBINED ENDOSCOPIC PANCREATIC FLUID COLLECTION AND RETROGRADE PANCREATOGRAPHY [abstract]. *(E.)* Kawanishi, H.; Sell, J. E.; Pollard, H. M. (Univ. Michigan Med. Sch., Ann Arbor, Mich.). *Gastroenterology* 68(4):1033, 1975.

8880 SECRETIN STIMULATED SECRETORY PRESSURES IN THE MAIN PANCREATIC DUCT AS MEASURED DURING ENDOSCOPIC CANNULATION [abstract]. *(E.)* Gregg, J. A.; Sharma, M. M. (New England Deaconess Hosp., Boston, Mass.). *Gastroenterology* 68(4):906, 1975.

8881 COMBINED ENDOSCOPIC PANCREATOGRAPHY (EPGM) AND ULTRASONOGRAPHY (USG) FOR THE DIAGNOSIS OF PANCREATIC DISEASE [abstract]. *(E.)* Gregg, J. A.; MacDonald, D.; Gramm, H. (New England Deaconess Hosp., Boston, Mass.). *Gastroenterology* 68(4):906, 1975.

8882 THE EFFECT OF SECRETIN ON PANCREATIC JUICE FLOW RATES DURING ENDOSCOPIC CANNULATION OF THE MAIN PANCREATIC DUCT [abstract]. *(E.)* Gregg, J. A.; Sharma, M. M. (New England Deaconess Hosp., Boston, Mass.). *Gastroenterology* 68(4):905, 1975.

8883 PANCREATIC DUCT LENGTH AND ACINAR CELL FUNCTION IN HEALTH AND PANCREATIC DISEASE [abstract]. *(E.)* DiMagno, E. P.; Hughes, R. W.; Stephens, D. H.; Malagelada, J. R.; King, J. E.; Go, V. L. W. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 68(4):883, 1975.

8884 NUTRITION ASSESSMENT AND MANAGEMENT OF SEVERE ACUTE PANCREATITIS [abstract]. *(E.)* Blackburn, G. L.; Williams, L. F.; Clowes, G. H. A.; Hirsch, I.; Phillips, E.; Gregg, J. (Boston City Hosp., Boston, Mass.) *Gastroenterology* 68(4): 865, 1975.

8885 EVIDENCE THAT THE PANCREATIC FACTOR ENHANCING B_{12} ABSORPTION IS NEITHER TRYPSIN (T) NOR CHYMOTRYPSIN (C) [abstract]. *(E.)* Toskes, P.; Francis, G.; Smith, G.; Sander, E. (VA Hosp., Gainesville, Fla.). *Clin. Res.* 23(3):258A, 1975.

8886 PANCREATIC CEA-LIKE ACTIVITY AND SERUM IN HEALTH AND PANCREATIC DISEASE [abstract]. *(E.)* DiMacno, E. P.; Moertel, C. G.; Go, V. L. W. (Mayo Clin., Rochester, Minn.). *Clin. Res.* 23(3):248A, 1975.

8887 PANCREATIC CYSTS. *(E.)* Campbell, G. (Waikato Hosp., Hamilton, New Zealand). *Practitioner* 214(1284):786-794, 1975.

8888 CYSTIC FIBROSIS. *(E.)* Holzel, A. (Dept. Child Health, Univ. Manchester, Manchester, England). *Practitioner* 214(1284):776-785, 1975.

8889 PANCREATIC AND GASTROINTESTINAL TRAUMA IN CHILDREN. *(E.)* Grosfeld, J. L.; Cooney, D. R. (Indiana Univ. Sch. Medicine, Indianapolis, Indiana). *Pediatr. Clin. North Am.* 22(2):365-377, 1975.

8890 WATERY DIARRHOEA AND HYPOKALAEMIA ASSOCIATED WITH A PHAEOCHROMOCYTOMA. *(E.)* Loehry, C. A.; Kingham, J. G. C.; Whorwell, P. J. (Royal Victoria Hosp., Bournemouth, England). *Postgrad. Med. J.* 51(596):416-419, 1975.

8891 SPONTANEOUS RESOLUTION OF A PANCREATIC PSEUDOCYST BY PERFORATION INTO THE COLON. *(E.)* Khan, T. A. (Dept. Surgery, Univ. Manitoba, Winnipeg, Canada). *Can. J. Surg.* 18(4):349-353, 1975.

8892 SPECIFIC DETECTION OF ABNORMALLY HIGH LEVELS OF PANCREATIC ISOAMYLASE IN URINE [abstract]. *(E.)* Shimamura, J.; Fridhandler, L.; Berk, J. E. (Coll. Med., Univ. California Irvine, Irvine, Calif.). *Clin. Res.* 23(3):256A, 1975.

8893 HYPERAMYLASEMIA ASSOCIATED WITH CANCER: DEMONSTRATION OF AN ANOMALOUS ISOAMYLASE COMPONENT [abstract]. *(E.)* Shimamura, J.; Fridhandler, L.; Berk, J. E. (Coll. Med., Univ. California Irvine, Irvine, Calif.). *Clin. Res.* 23(3): 256A, 1975.

8894 NON-PANCREATIC HYPERAMYLASEMIA IN PANCREATIC CANCER [abstract]. *(E.)* Shimamura, J.; Berk, J. E.; Fridhandler, L. (Coll. Med., Univ. California Irvine, Irvine, Calif.). *Clin. Res.* 23(3):256A, 1975.

8895 BILE SALT KINETICS IN CYSTIC FIBROSIS (CF): INFLUENCE OF PANCREATIC REPLACEMENT [abstract]. *(E.)* Watkins, J. B.; Tercyak, A. M.; Szczepanik, P.; Klein, P. D. (Children's Hosp. Med. Cent., Boston, Mass.). *Gastroenterology* 68(4): 1087, 1975.

8896 THE NEONATAL DIAGNOSIS OF CYSTIC FIBROSIS. *(Fr.)* Feigelson, J. (No affiliation given). *Pediatre* 11(50):53-54, 1974.

8897 RELATED MORPHOLOGICAL CHANGES OF THE PANCREAS IN NON-PANCREATIC DISEASES. *(Ger.)* Becker, V. (Pathologischen Inst., Univ. Erlangen-Nurnberg, Erlangen, Germany). *Inn. Med.* 1(2):122-130, 1974.

8898 INTRAPANCREATIC GROWTH AND INFILTATION OF MALIGNANT TUMOR ARISING IN THE PANCREAS. *(Jpn.)* Koizumi, T.; Nakase, A. (Kyoto Univ. Medicine Sch., Kyoto, Japan). *Arch. Jpn. Chir.* 43(5):373-378, 1974.

8899 GALLBLADDER ANOMALIES IN CYSTIC FIBROSIS: 57 CASES. *(Fr.)* Feigelson, J.; Mareschal, J. L.; Sauvegrain, J. (37, rue Navier, 75017 Paris, France). *Med. Chir. Dig.* 4(2):121-124, 1975.

8900 PANCREATIC CARCINOMA IN RATS: IMPLANTATION EXPERIMENT. *(Ger.)* Klemm, G.; Mehnert, W. H. (Klinik Innere Medizin, Ernst-Heydemann-Strasse, Rostock, Germany). *Z. Gesamte. Inn. Med.* 30(13):452-454, 1975.

8901 INTERRUPTION OF THE ENTEROHEPATIC CIRCULATION (EHC) OF BILE ACIDS (BA) IN CYSTIC FIBROSIS (CF) [abstract]. *(E.)* Weber, A. M.; Roy, C. C.; Lepage, G.; Chartrand, L.; Lasalle, R. (Hosp. St.-Justine, Montreal, Quebec, Canada). *Gastroenterology* 68(4):1066, 1975.

See also, 8418, 8427, 8441, 8443, 8455, 8458, 8648, 8850, 8902, 8918, 8919, 8942, 9023, 9031, 9146, 9271, 9302, 9305, 9328, 9354.

PANCREAS

Pancreatitis

8902 ENDOSCOPIC PANCREATOGRAPHY: AN ANALYSIS OF THE RADIOLOGIC FINDINGS IN PANCREATITIS. *(E.)* Robbins, A. H.; Messian, R. A.; Widrich, W. C.; Paul, Jr., R. E.; Norton, R. A.; Schimmel, E. M.; Ogoshi, K. (Tufts Univ. Sch. Medicine, Medford, Mass. 02155). *Radiology* 113(2):293-296, 1974.

An analysis of the roentgenological findings in pancreatitis using endoscopic pancreatography is presented for 46 patients with either strong clinical criteria for diagnosis or subsequent surgical proof of pancreatitis. Patients were sedated with 2 to 20 mg of diazepam, i.v., and the endoscope was introduced into the duodenum. Then 5 to 10 mg of propantheline bromide was given, i.v., to induce duodenal hypotonia. A Teflon cannula (1.7 mm O.D.) was then passed through the endoscope into the ampulla of Vater. Two to three ml of Renografin-60 was injected through the cannula for visualization of the pancreatic duct and 15 ml was used to visualize the biliary tree. Fluoroscopic spot films were then obtained. The results were as follows: 41.3% showed a normal system; 4.3% showed minimal changes; 30.4% showed moderate changes and 24% showed marked changes. Minimal changes included irregularity, dilatation, and stenosis in the duct branches. Moderate changes were tortuosity, dilation, and minimal to moderate stenosis of the pancreatic duct. Marked changes included obstruction, cyst formation, or calculi plus moderate changes in the main pancreatic duct. There was no correlation of duration of disease with severity of pathologic changes. It is suggested that endoscopic pancreatography may be a useful adjunct for confirming diagnosis and defining pathology of pancreatic disease, and may also be used to determine the surgical procedure required by defining the pathologic anatomy. It also provides visualization of the pancreatico-biliary tree in a greater majority of cases than conventional invasive and non-invasive means.

8903 PROMINENT FOLDS ON THE POSTERIOR WALL AND LESSER CURVATURE OF THE STOMACH: A SIGN OF ACUTE PANCREATITIS. *(E.)* Balthazar, E.; Henderson, M. (Metropolitan Hosp. Center, New York, N.Y.). *Radiology* 110(2):319-321, 1974.

The diagnostic reliability of localized irregularities of the posterior wall and/or lesser curvature of the stomach as a sign of acute pancreatitis was determined. The mucosa was visualized in the barium-filled stomachs of 38 patients with acute pancreatitis. Abnormalities of the upper gastrointestinal tract occurred in 74% of the cases and duodenal sweep changes occurred in 16 of 38 cases. A marked irregularity of the posterior wall and/or lesser curvature was observed in eight cases, three of whom had no other gastrointestinal abnormalities. The selective prominence of the gastric rugal folds depended on the time elapsed since the clinical onset of the disease; rugal prominence disappeared as the symptoms subsided. A direct correlation was observed between the intensity of the inflammatory process and the presence of the folds. Thus, selective rugal prominence may serve as a reliable and frequent sign of acute pancreatitis. Recognition and correct interpretation of irregularities of the posterior wall and/or lesser curvature will help to establish a correct diagnosis.

8904 PANCREATIC ENCEPHALOPATHY: THE DIFFICULTY AND IMPORTANCE OF DIAGNOSIS. THREE CASES. *(Fr.)* Aubert, P.; Lainee, J.; Duron, F.; Reboul, M. (Hôpital Paul-Brousse, 94800 Villejuif, France). *Rev. Fr. Gastroenterol.* (103):7-20, 1974.

The polymorphism of the neuropsychic manifestations accompanying pancreatitis was studied in three cases where a pancreatic encephalopathy (PE) was suspected. In case one, acute hallucinatory delirium with muscular hypertonia was reported in a 39-yr-old male. The usual treatment for delirium tremens was inefficient. Clearing of the delirium occured after a treatment with anti-enzymes, and calcifying pancreatitis was discovered. The second case (a 69-yr-old male) was a chronic alcoholic, and was suffering from choledocholithiasis, pancreatitis, cytosteatonecrosis and PE. The third patient had been hospitalized for an episode of epileptic seizure, a hyperglycemia accompanied by acute abdominal syndrome with melena, cecal necrosis, chronic pancreatitis and hemorrhagic suffusion; he died two days after surgery. The frequency of PE was difficult to assess as was the time of onset of the neuropsychological symptoms in relation to the pancreatitis *per se*, although these factors seemed to be subordinate to it. The psychological signs of PE were: mental confusion, disorientation, psychomotor agitation, and delirium with visual hallucination. The neurological signs, such as muscular hypertonia, were not always present. An important diagnostic tool was recognition of increased amylase levels in the blood and urine. The mechanism for PE remains unknown; however, it is sug-

gested that the pancreatitis may liberate elements into the vascular system which irritate the nervous system. It is suggested that these elements may be trypsin and lipase.

8905 CHRONIC PANCREATITIS AND ALPHA-1-ANTITRYPSIN. *(E.)* Novis, B. H.; Young, G. O.; Bank, S.; Marks, I. N. (Grote Schuur Hosp., Cape Town, South Africa). *Lancet* 2(7938):748-749, 1975.

The prevalence of the various Pi phenotypes of α_1-antitrypsin was determined in 110 patients with chronic pancreatitis and compared with that in 116 blood donors. Alcohol was considered the cause of the chronic pancreatitis in 98 patients; the other 12 had idiopathic pancreatitis. Serum α_1-antitrypsin levels were measured by immunodiffusion and the pattern of the Pi phenotype was determined by acid starch-gel electrophoresis. The PiMM phenotype was significantly less common in the patients with pancreatitis (70%) than in the controls (87%), while the PiMZ phenotype (including Mweak) was significantly more prevalent in the patients (9%) than in the controls (0%). The MS phenotype was also more frequent in patients with chronic pancreatitis (16%) than in controls (10%), but the difference was not significant. Thirty-one of the 33 patients with a Pi phenotype other than MM had evidence of pancreatic calcification, and 21 had grossly deficient pancreatic exocrine function. Alcohol was implicated in 29 of these 33 cases. The decreased frequency of the PiMM phenotype and the greater frequency of the PiMZ in the patient group suggests an association between heterozygous α_1-antitrypsin deficiency and chronic pancreatitis. This deficiency might render the pancreas more vulnerable to the effect of alcohol or other etiological agents, or it might result in the pancreas being less able to combat the destructive effects of trypsin and other proteolytic enzymes during an acute attack.

8906 ELASTASE LEVELS DURING BILE-INDUCED PANCREATITIS IN DOGS DETERMINED BY RADIOIMMUNOASSAY. *(E.)* Kasahara, K.; Carballo, J. R.; Takada, Y.; Appert, H. E.; Howard, J. M. (Medical Coll. Ohio, Toledo, Ohio). *Surg. Gynecol. Obstet.* 141(3):347-351, 1975.

By using the new method of radioimmunoassay, the changes in elastase levels were studied in the plasma and ascitic fluid before and after bile-induced pancreatitis in ten mongrel dogs. The dogs were fasted overnight. Under pentobarbital sodium-induced anesthesia, the femoral vein was exposed and cannulated for infusion of Ringer's lactated solution, maintenance of anesthesia and drawing of blood samples. A polyvinyl cathether was inserted in a cephalic direction through a branch of the pancreaticoduodenal vein. The catheter was connected to the infusion set filled with heparinized Ringer's solution. The caudal pancreaticoduodenal vein was ligated and divided, but the caudal pancreatic arteries were maintained intact to preserve the blood supply of the right lobe. The vascular connections between the pancreas and the duodenum were ligated. The right gastroepiploic vein also was ligated. The gastroduodenal vein was exposed immediately proximal to the point at which the right gastroepiploic vein joins it. A snare passed around the vein at this point was used to occlude the vein at the time when blood samples were drawn through the catheter. To inject the entire pancreas with bile, the tip of the Teflon (polytetrafluoroethylene) tube (inserted through the duodenal opening) was located immediately proximal to the bifurcation of the duct. Heparinized blood samples were drawn from the pancreatic and the femoral vein at intervals of 15, 30 and 45 min as well as 1, 2, 3, and 5 hr after the beginning of the injection of the bile. Ascitic fluid was collected as completely as possible at 30 min, 1, 2, 3, and 5 hr after the beginning of the bile injection. Total elastase activity was measured after activation of proelastase by the addition of 5 mg of trypsin. Free elastase activity was measured in the presence of 500 U of Trasylol (aprotinin) which prevents the possibility of activation of proelastase by trypsin. Although the amylase and lipase levels increased markedly, there was no significant increase in the plasma elastase levels. On the other hand, the elastase levels of the blood in the femoral and pancreatic veins, as measured by radioimmunoassay, increased about ten times above the control levels. Similarly, in pancreatitis, large amounts of elastase, determined by radioimmunoassay, were found in the ascitic fluid. At that time, no elastase activity could be determined in the ascitic fluid using a fluorometric method. In this study, it is suggested that circulating inhibitors interfere with the determination of elastase enzymatic activity but do not interfere with the radioimmunoassay of elastase. At the present time, however, it has not been determined whether elastase inhibitor in ascites is the same as that in serum.

8907 THE PROTEOLYTIC PROENZYMES IN THE PERITONEAL EXUDATE DURING ACUTE EXPERIMENTAL PANCREATITIS OF THE RAT. *(E.)* Huttunen, R. (Dept. Anatomy, Univ. of Oulu, Oulu, Finland). *Acta Chir. Scand.* 141(4):285-288, 1974.

The presence of precursors of proteolytic enzymes in the peritoneal inflammatory exudate of rats with acute experimental pancreatitis was investigated. Activation of proenzymes from exudate and plasma fractions was performed using enterokinase (2 mg/ml) and trypsin (0.4 mg/ml). The N-alpha-benzoyl-DL-arginin-4-nitroanilid-hydrochlorid (BAPNA), succinyl-L-phenylalanine-*p*-nitroanilide (SUPHEPA), and N-acetyl-L-tyrosine ethyl ester (ATEE) hydrolysate activities were determined along with trypsin-inhibiting capacity (TIC). Protein content of gel filtration fractions was performed spectrophotometrically at 280 nm. Proteolytic activities, proenzymes and proteinase-inhibiting factors were studied from the fractions obtained by Sephadex G-200 gel filtration. The first BAPNA-hydrolysis activity was demonstrated with and without enterokinase activation. The latter peak of BAPNA-hydrolysis activity, eluted after main protein and TIC, required enterokinase incubation. No BAPNA activity was found within control exudate fractions. Trypsin activation was found in the exu-

dates obtained during pancreatitis, but not in control exudates. The activated enzymes were able to hydrolyze BAPNA, ATEE, and SUPHEPA. The minimal enzyme activation times with enterokinase varied with substrate studied: BAPNA, one hr; ATEE, 15 min; and two hr for SUPHEPA. The maximum time needed for highest activity varied from 10 to 30 hr. The proenzymes could be separated from inhibitors by gel filtration indicating that the enzyme-inhibitor complex formation is enzymatically-mediated. These results demonstrate, qualitatively, the presence of enzyme precursors in inflammatory peritoneal exudate during pancreatitis. The absence of enzyme precursors from the exudate of induced-peritonitis, suggests that the proenzymes present in the exudate of pancreatitis are of pancreatic origin.

8908 RELEASE OF PROTEOLYTIC ENZYMES IN BILE-INDUCED PANCREATITIS IN DOGS. *(E.)*

Ohlsson, K.; Eddeland, A. (Malmö General Hosp., S-214-01 Malmö, Sweden). *Gastroenterology* 69(3): 668-675, 1975.

The trypsin, chymotrypsin, elastase α_1-antitrypsin, and α_2-macroglobulin levels were measured in the pancreatic exudate, ascitic fluid, thoracic lymph, and plasma following the injection of bile (0.5 ml/kg) into the pancreatic ducts of fasted, anesthetized mongrel dogs of both sexes. Bile injection was followed by a fall in the mean arterial pressure to 45 to 60% of the control values; the pressure then returned to almost normal levels before the ultimate drop. All animals died 5 to 12 hr after bile injection. Autopsy revealed severe hemorrhagic pancreatitis with severely damaged pancreatic glands; the hematocrit of the femoral venous blood was increased 20 to 35% and the amylase activity was increased seven-fold. The initial fall in blood pressure was accompanied by the appearance of large quantities of active trypsin, chymotrypsin, and elastase in the pancreatic exudate, with full saturation of protease inhibitors. The ascitic fluid, lymph, and plasma showed lower peak concentrations and progressively lower rises in enzyme content. The enzymes in the ascitic fluid and lymph appeared only in the form of complexes with α_1-antitrypsin and α_2-macroglobulin. No such complexes were detected in the venous blood, indicating short half-life in the circulation. The results show that proteolytic enzymes of the pancreas are released in active form in bile-induced pancreatitis, thus supporting the concept of autodigestion in pancreatitis. More detailed immunochemical studies with antisera specific for human pancreatic proteases and plasma protease inhibitors should prove rewarding in studies of acute pancreatitis in man.

8909 CHRONIC PANCREATITIS, ALCOHOLIC LIVER CIRRHOSIS AND SALIVARY SECRETION. *(E.)*

Minaire, Y.; Descos, L.; Lambert, R. (Hopital Edouard-Herriot, Lyon, France). *Digestion* 12(1):57-60, 1975.

A study was conducted to determine if an alteration in salivary secretion accompanied exocrine pancreatic secretion in chronic pancreatitis (CP) and in alcoholic liver cirrhosis (ALC). Saliva was examined in 14 patients with CP, in nine with ALC and in 13 controls. All patients with CP had histories of substantial alcohol consumption. Basal saliva was aspirated through a dental sucking tube, saliva stimulation was performed by chewing parafilm followed by expectoration into a collection bottle. Measurements of volume, bicarbonate, chloride and amylase content were performed on 15-min samples. Both CP and ALC caused a reduction in basal saliva volume (ml/15 min). The values were: control, 16.9; CP, 10.4; and 9.4 for ALC. For bicarbonate the values were: control, 8.6 mM; CP, 6.2 mM; and 3.3 mM for ALC. The chloride values were: control, 17.7 mM; CP, 23.5 mM; and 20.1 mM for ALC. Amylase concentration values were: control, 7.0 (Lagerl U); CP, 6.4; and 3.2 for ALC. The differences compared to controls were significant for volume, bicarbonate and amylase outputs in CP and for all parameters in ALC. The chloride concentration in the stimulated saliva of CP patients was significantly different from the control value. This difference was interpreted as being due to decreased canalicular reabsorption. These results show that salivary changes due to CP or ALC are not glandular-mediated directly but are due to large alcohol consumption, which causes a decreased sensitivity through nervous control rather than affecting secretory capacity.

8910 MASSIVE ASCITES ASSOCIATED WITH PANCREATITIS: REVIEW BASED ON 10 CASES. *(Fr.)*

Geffroy, Y.; Colin, R.; Testart, J.; Bourreille, J.; Ledouarec, P.; Paillot, B.; Joram, F. (Hôpital Charles Nicolle, 76038 Rouen Cedex, France). *Sem. Hop. Paris* 51(14):927-934, 1975.

Massive ascites associated with pancreatitis was investigated in ten patients (mean age 35 yr) and the results were compared to 100 similar cases taken from the literature. Massive ascites appeared as a rare complication in pancreatitis. Alcoholism was concurrent in 70% of the cases. Some ascites occurred after abdominal trauma, some after an already diagnosed pancreatitis, and in the majority of patients, ascites was present before the onset of pancreatitis. The color of the ascitic liquid varied from a light yellow to a dark pink. The clinical signs were those of pancreatitis in addition to peritoneal effusion. Temperature elevation and abdominal pain were common symptoms. Associated lesions resulted in pleural and pericardial effusion, as well as cutaneous, vascular and neuropsychiatric syndromes. Titration of pancreatic enzymes proved essential for diagnosis. Amylase, lipase, and eosinophil levels were often elevated. Blood tests revealed high levels of amylase, leukocytes, and albumin. Ascites were formed by (1) a loss of pancreatic fluid through a breach in the pancreas and (2) peritonitis. A cure for the ascites can be obtained through fluid drainage during exploratory laparotomy or through surgical drainage by a gastropancreatic anastomosis.

8911 MARKED HYPERVASCULARITY AND ARTERIOVENOUS SHUNTING IN ACUTE PANCREATITIS. *(E.)* Roe, M.; Greenough, W. G. (Baylor Univ. Medical Center, Dallas, Texas 75246). *Radiology* 113(1):47-48, 1974.

Angiographic findings in a single case with acute pancreatitis were reported. A 50-yr-old male was admitted with a six month history of epigastric pain and back discomfort unresolved by antacids or anticholinergic drugs. Physical exam revealed slight tenderness on deep epigastric palpitation. Oral cholecystography, cine-esophagography, serum lipase and amylase, urine amylase (24 hr), barium enema, gastric acid analysis, electrocardiogram, and serum electrolytes were all negative. Gastroscopy revealed inflammation in the duodenum and prepyloric gastric antrum. Gastritis was diagnosed and the patient was released. Upon readmission due to increased epigastric pain, serial chemistry showed elevated bilirubin, SGOT, and alkaline phosphatase levels. Fasting blood sugar, BUN, electrolytes and three blood cultures were negative. Abdominal arteriography (initial aortic flush) showed pancreatic staining. Selective injections revealed intense pancreatic hypervascularity and arteriovenous shunting with early mesenteric and portal venous filling. The differential diagnosis included: pancreatitis, diffuse neoplasm, cystadenoma, angiosarcoma, cavernous hemangioma and hemangioendothelioma. A pancreatic biopsy revealed obstruction of the common and pancreatic ducts by a hamartoma, 3 x 4 x 8 cm, in the ampulla of Vater. Cholecystectomy was performed due to the presence of an adenomyoma. It is concluded that diagnosis of pancreatitis by angiography is difficult due to variability in the extent of hypovascularity, hypervascularity or enlargement of the pancreas.

8912 JUVENILE CALCIFYING CHRONIC PANCREATITIS OF ISCHEMIC ORIGIN? *(Fr.)* Le Bras, M.; Langlois, J.; Renambot, J.; Lamouche, P.; Renaud, A.; Bertrand, E. (Chaire de Clinique Medicale, C.H.U., Abidjan, Cote d' Ivoire). *Arch. Fr. Mal. App. Dig.* 63(8):639-644, 1974.

A 12-yr-old black African boy was admitted to the hospital suffering from prolonged and recurrent epigastric pains of no definite origin. Chronic calcifying pancreatitis was demonstrated radiologically. No exocrine pancreatic insufficiency, diabetes or malnutrition accompanied the pancreatitis. Abuse of alcohol was also inapplicable. Bilharzia as a cause was discarded for three reasons: (1) the boy did not live in an area where bilharzia was endemic, (2) the rectal biopsy of the mucous membrane was negative and (3) the specific immunologic serology was also negative. Ascariasis and eosinophilia were not suspected. If it were a case of hereditary pancreatitis, then each generation would be afflicted, transmission being autosomic and dominant; this was not the case. No hyperlipidemia was present. No traumatic or infectious episode preceded the pancreatitis. Antigen Au was negative. The following led to the diagnosis of ischemic calcific chronic pancreatitis: (1) vascular abnormalities of congenital origin, (2) no celiac trunk, (3) the hepatic artery and the left gastric artery derived directly from the aorta, (4) the splenic artery shot out from the superior mesenteric artery and (5) no gastro-duodenal artery nor pancreaticoduodenal arches were present. Hence, the poor vascularization of the pancreas could be the cause, as well as the consequence of this disease.

8913 PANCREATITIS WITH VIRAL HEPATITIS AND HEPATIC COMA. *(Ger.)* Lankisch, P. G.; Rahlf, G.; Schmidt, H.; Creutzfeldt, W. (Med. Clin., Univ. Gottingen, Germany). *Z. Gastroenterol.* 13 (3):407-412, 1975.

Clinical and pathological evidence is presented which suggests that the common viral etiology of acute pancreatitis and fulminant hepatitis does not account for the frequent association of acute pancreatitis with hepatic coma. Serum and urinary amylase activities, determined for 35 patients with viral hepatitis (20 hepatitis B antigen-positive and 15 hepatitis B antigen-negative), were all within the normal range. These patients had clinical courses which varied in severity and included three with hepatic coma and two with precoma. A retrospective study was performed on 85 autopsied patients who had died in hepatic coma. These consisted of (1) 22 patients with acute hepatic necrosis (of viral etiology in 20 cases and halothane-induced in 2); (2) eight patients with subacute hepatic necrosis of viral etiology; and (3) 55 patients with cirrhosis. Acute pancreatitis was present in 5 of the 30 with acute or subacute hepatic necrosis (16.7%) and in 10 of the 55 with cirrhosis (18.2%). Of the five patients with hepatic necrosis and acute pancreatitis, four had been given steroids, two were alcoholics, three had biliary disease, one had undergone cholecystectomy for cholelithiasis (the common bile and pancreatic ducts had a common outlet), and two patients had gastric bleeding. One other patient had localized pancreatic fibrosis. In the ten patients with cirrhosis, pancreatitis was less severe than in those with hepatic necrosis. Fatty necrosis of the pancreas was the most common finding in cirrhotics; seven other patients had localized pancreatic fibrosis. Of the patients with cirrhosis and pancreatitis, eight had massive gastric bleeding, four had undergone shunt surgery, two had biliary disease, two had thrombosis of the portal vein, and one had a duodenal diverticulum in the papilla of Vater. Pancreatitis was diagnosed only at autopsy in all patients who died of hepatic coma.

8914 OSTEOMALACIA AND CHRONIC PANCREATITIS. *(Fr.)* Prost, A.; Hanniche, M.; Bordier, P.; Miravet, L.; de Seze, S.; Rambaud, J. C. (Service de Medecine generale et de Rhumatologie Hopital Saint-Jacques 85, rue Saint-Jacques, F 44035 Nantes, France). *Nouv. Presse Med.* 4(21):1561-1566, 1975.

A new digestive etiology is reported for osteomalacia (OM) and chronic pancreatitis (CP). OM patients could not hydrolyze the triglycerides necessary to solubilize vitamin D_3. Five patients among the 44

OM patients investigated also suffered from CP. In two cases, the diagnosis of CP was 6 to 12 yr after that of OM. The observed CP was always calcifying. CP was linked to chronic alcoholism and steatorrhea. All patients presented with an associated factor which could have triggered the onset of OM and CP such as: alcoholic cirrhosis, gastrectomy with gastrojejunal anastomosis, blind loop syndrome, primary hyperparathyroidism or a long history of anticonvulsive drug treatment. The associated factors could have worsened the vitamin deficiency through anorexia, increased malabsorption of vitamin D, defective activation of vitamin D (as in cirrhotics) or increased vitamin demand by absorption of anticonvulsive drugs. It is concluded that exocrine pancreatic insufficiency does not induce OM *per se*.

8915 ETIOLOGY OF STRICTURES OF THE COLON ASSOCIATED WITH PANCREATITIS. *(E.)* Hunt, D. R.; Mildenhall, P. (St. George Hosp., Kogarah, 2217, New South Wales, Australia). *Am. J. Dig. Dis.* 20(10):941-946, 1975.

Only 13 cases of colonic strictures associated with pancreatitis have been reported in the literature. Three new cases were described in which the histologic features strongly resembled those seen in strictures of ischemic origin. Ischemic colitis was suspected in a 65-yr-old man and, although initial findings suggested transient (mucosal) ischemic colitis, laparotomy revealed progression to the gangrenous stage. The association with pancreatitis was not recognized until postmortem examination, but the presence of thickening of the transverse mesocolon and splenic pedicle was noted at laparotomy. The stricture extended from the distal transverse colon to the descending colon. A 63-yr-old man and a 52-yr-old woman both developed strictures in the colon after pancreatitis. In the former, a mass in the tail of the pancreas was adherent to the greater curvature of the stomach and splenic flexure of the colon. The stricture in the third patient was just distal to the splenic flexure. In each of these three cases the mucosa was intact, but there was submucosal fibrosis and/or submucosal vessel thrombosis, hemosiderin-laden macrophages, granulation tissues, and muscle necrosis. The presence of hemosiderin-containing macrophages and evidence of submucosal vessel thrombosis are diagnostic features of ischemic damage, and indicate that narrowing of the colon is due to changes in the bowel wall and not to extraluminal compression. It is postulated that ischemia, and not encircling pericolic inflammation, is the cause of strictures associated with pancreatitis.

8916 ACUTE PANCREATITIS: A PROSPECTIVE STUDY AND SOME FACTORS IN MORTALITY [abstract]. *(E.)* Imrie, C. W.; Frew, E. M. S.; Jones, W. L.; Blumgart, L. H. (Glasgow R. Infirm., Scotland). *Gut* 16(5):406, 1975.

8917 ACUTE PANCREATITIS IN NOTTINGHAM 1969-1973: A RETROSPECTIVE VIEW [abstract]. *(E.)* Bourke, J. B. (Univ. Nottingham, Dept. Surg., England). *Gut* 16(5):405-406, 1975.

8918 CARCINOEMBRYONIC ANTIGEN AND CYTOLOGY OF PANCREATIC FLUID [abstract]. *(E.)* Kawanishi, H.; Sell, J. E.; Pollard, H. M. (Univ. Michigan Med. Sch., Ann Arbor, Mich.). *Gastroenterology* 68(4):923, 1975.

8919 ENZYMATIC ANALYSIS OF PURE PANCREATIC JUICE (PPJ) OBTAINED DURING THE ENDOSCOPIC CANNUALTION OF THE MAIN PANCREATIC DUCT (ECMPD) [abstract]. *(E.)* Gregg, J.; Sipos, T.; Sharma, M.; Gibbons, G.; Whalen, M.; Blackburn, G. (New England Deaconess Hosp., Boston, Mass.). *Gastroenterology* 68(4):904, 1975.

8920 AMPICILLIN THERAPY IN ACUTE PANCREATITIS [abstract]. *(E.)* Craig, R. M.; Dordal, E.; Kravitz, A. (Northwestern Univ. Med. Sch., Chicago, Ill.). *Gastroenterology* 68(4):878, 1975.

8921 REMOTE RESULTS OF SURGICAL TREATMENT OF CHRONIC PANCREATITIS. *(Rus.)* Trunin, M. A. (Faculty Clinic Surgery, Leningrad Sanitary Hygiene Medical Inst., USSR). *Khirurgiia (Mosk.)* (1):107-115, 1975.

8922 EFFECT OF LIOBYL ON THE EXCRETORY FUNCTION OF THE LIVER AND THE PANCREAS IN PATIENTS WITH CHRONIC CHOLECYSTO-PANCREATITIS AND WITH POSTCHOLECYSTOECTOMIC SYNDROME. *(Rus.)* Bereza, N. M. (Dept. Hepatic Pancreatic Diseases, Dnepropetrovsk Scientific Res. Inst. Gastroenterology, USSR). *Ter. Arkh.* 41(12):84-87, 1974.

8923 PROFUSE HAEMORRHAGES IN PANCREONECROSIS. *(Rus.)* Forafonova, I. N. (Dept. Hosp. Surgery, Aktyubinsk Medical Inst., USSR). *Khirurgiia (Mosk.)* (1):99-103, 1975.

8924 RESULTS OF SURGICAL TREATMENT OF CHRONIC PANCREATITIS. *(Rus.)* Sokolov, V. I.: Novgorodskaya, T. I.; Movchun, A. V. (All Union Scientific Res. Inst. Clinical Experimental Surgery, USSR). *Khirurgiia (Mosk.)* (1):103-107, 1975.

8925 COMPARATIVE EVALUATION OF TREATMENT OF ACUTE PANCREATITIS WITH ANTIENZYME AGENTS. *(Rus.)* Synovets, A. S.; Dekhtiar, A. L.; Khudoley, I. F. (Dept. Surgery Therapeutic Faculty, N. I. Pirogov Odessa Medical Inst., USSR). *Klin. Khir.* (2):22-26, 1975.

8926 RETROSPECTIVE ANALYSIS OF 111 CASES OF PANCREATITIS. *(Sp.)* Lieberman, M.; Ganem, G.; Fiqueros, J. A. (Hospital de Oncologia del Centro Medico Nacional, Instituto Mexicano del Seguro Social, Mexico). *Rev. Med. Inst. Mex. Seguro Soc.* 13(3):204-212, 1974.

8927 FAMILY PANCREATITIS AND MUCOVISCIDOSIS. *(Fr.)* Hardy, M.; Lenne, Y. (No affiliation given). *Bordeaux Med.* 8(7):785-787, 1975.

8928 PANCREATITIS IN CHILDREN. A STUDY IN THE NORTH OF ENGLAND. *(E.)* Sibert, J. R. (Dept. Child Health, Univ. Newcastle upon Tyne, England). *Arch. Dis. Child.* 50(6):443-448, 1975.

8929 THE EFFECTS OF ISOPROTERENOL AND l-NOREPINEPHRINE IN THE TREATMENT OF BILE-INDUCED HEMORRHAGIC PANCREATITIS IN DOGS [abstract]. *(E.)* Cazen, R.; Kerstein, M.D. (Yale Univ. Sch. Med., West Haven, Conn.). *Clin. Res.* 23(3):247A, 1975.

8930 FRACTIONATION OF SALIVARY (AMY_1) AND PANCREATIC (AMY_2) AMYLASE IN HYPERAMYLASEMIC PATIENTS [abstract]. *(E.)* Ward, J. C.; Lehrner, L. M.; Karn, R. C.; Merritt, A. D. (Indiana Univ. Sch. Med., Indianapolis, Ind.). *Clin. Res.* 23(3):260A, 1975.

8931 THE DEGREE OF PARALLELISM IN THE SECRETION OF PANCREATIC ENZYMES IN HEALTHY INDIVIDUALS AND IN PATIENTS WITH CHRONIC PANCREATITIS ANALYZED BY USING PANCREOZYMIN. *(Rus.)* Geller, L. I.; Bulgakova, O. S. (Dept. Hosp. Ther. Khabarovsk Med. Inst., USSR). *Vopr. Pitan.* (2):40-42, 1975.

8932 GASTROINTESTINAL HEMORRHAGES DURING ACUTE PANCREATITS. *(It.)* Gianpaglia, F.; Cecere, C.; Fraioli, G. (2nd Med. Surg. Fac., Univ. Naples, Italy). *Rass. Int. Clin. Ter.* 54(23):1407-1412, 1974.

8933 THE PLACE OF SURGERY IN THE TREAMENT OF PRIMARY CHRONIC PANCREATITIS. *(Fr.)* Poilleux, J.; Lichtenstein, H. (St. Antoine Hosp., Paris, France). *Concours Med.* 97(9):1416-1426, 1975.

8934 COMPARATIVE CHARACTERISTICS OF THE THERAPEUTIC EFFECT OF PROTEASE INHIBITORS IN ACUTE PANCREATITIS. *(Rus.)* Khudolei, I. F. (Odessa Medical Inst., USSR). *Vrach. Delo* (4):25-28, 1975.

8935 ACUTE PANCREATITIS AND PANCREATIC NECROSIS. *(Ger.)* Zastrow, R. (Klinik Innere Medizin, Universitat Rostock, Germany). *Z. Aerztl. Fortbild.* 69(8):410-412, 1975.

8936 ACUTE HEMORRAGIC PANCREATITIS IN CHILDREN. *(It.)* Cannavo, A. (Ospedale S. Marta e S. Venera in Acireale, Italy). *Osp. Ital. Chir.* 27(2-3): 103-108, 1974.

8937 ACUTE PANCREATITIS. *(It.)* Docimo, R.; Masella, A. (Facolta de Medicina e Chirurgia, Univerista de Napoli, Napoli, Italy). *Rass. Int. Clin. Ter.* 55(5):255-265, 1975.

8938 NOTES ON ACUTE PANCREATITIS FOLLOWING BILE DUCT SURGERY. *(It.)* Bergamaschi, R.; Dallari, A.; Morini, C.; Melotti, G. (Surgical Div., Modena Hosp., Modena, Italy). *Chirurgia* 36(66):1720-1725, 1975.

8939 BLOOD TRYPSIN IN ACUTE PANCREATITIS. *(It.)* Casolaro, M.; De Simone, E.; Vella, M. (Ospedaliero Regionale Generale, Naples, Italy). *Rass. Int. Clin. Ter.* 55(7):390-393, 1975.

8940 THE ACUTE PANCREATITIS IN CHILDREN. *(It.)* Bartoli, G. C.; Cappello, S. E. (Ospedaliero Regionale Specializzato, Napoli, Italy). *Rass. Int. Clin. Ter.* 55(5):266-275, 1975.

8941 ACUTE PANCREATITIS. *(Fr.)* Hureau, J. (Hopital Vaugirard, 75015 Paris, France). *Med. Chir. Dig.* 4(2):99-108, 1975.

8942 INTRAPERITONEAL LIPASE AND TRYPSIN IN EMERGENCY ABDOMINAL SURGERY: INTERPRETATION OF THEIR ACTIVITIES IN PERITONEAL FLUID OBTAINED BY PARACENTESIS WITH OR WITHOUT LAVAGE. *(Fr.)* Tamarelle, C.; Perissat, J.; Saric, J.; Doutre, L. P. (Clinique Chirurgicale A., 311 Bl du President-Wilson, 33200 Bordeaux, France). *Med. Chir. Dig.* 3(5):331-335, 1974.

8943 PERIPANCREATIC CLEANSING BY RETROPERITONEAL DIALYSIS: AN ADJUNCT TO SURGERY FOR ACUTE NECROTIZING PANCREATITIS. *(Fr.)* Vankemmel, M. (Cite Hospitaliere, 59000 Lille, France). *Med. Chir. Dig.* 4(2):113-119, 1975.

8944 PERFORATIONS OF ACCESSORY BILE DUCTS IN THE COURSE OF ACUTE PANCREATITIS. *(Fr.)* Combe, J.; Milleret, P. (Clinique Chirurgicale Universitaire, C.H.R. Besancon, France). *Med. Chir. Dig.* 4(2):109-112, 1975.

See also, 8215, 8377, 8423, 8428, 8431, 8821, 8869, 8870, 8874, 8875, 8879, 8880, 8881, 8882, 8883, 8886, 8892, 9023, 9270, 9272.

8945 ANGIOGRAPHIC FINDINGS IN BENIGN LIVER CELL TUMORS. *(E.)* Goldstein, H. M.; Neiman, H. L.; Mena, E.; Bookstein, J. J.; Appleman, H. D. (Univ. Michigan Medical Center, Ann Arbor, Mich.). *Radiology* 110(2):339-343, 1974.

The angiographic features of two cases of liver cell adenoma and four cases of focal nodular hyperplasia (FNH) were compared with the angiographic features of eight cases of malignant hepatoma. Pathologic distinctions of various benign liver cell masses were also discussed. Five of the six patients with benign liver cell tumors were symptomatic, while in one a lesion was discovered incidentally during evaluation for trauma. The angiographic features of liver cell adenoma and FNH were similar. Both patients with liver cell adenoma and two patients with FNH had an enlarged hepatic artery. All 6 patients demonstrated hypervascularity. In four cases, the arterial supply originated from the periphery of the mass with numerous relatively parallel vessels supplying the lesion. There was no evidence of arteriovenous shunting, portal vein invasion, or vascular laking. One of the liver cell adenomas and three of the FNH cases showed considerably more prominent vascular staining than the adjacent normal parenchyma, while in the other two cases there was only minimally increased stain. A distinct tumor margin could be recognized in the parenchymal phase of all cases, except one with FNH. The angiographic findings of benign lesions usually differ sufficiently from those of most malignant hepatomas to enable presumptive diagnosis. While abnormal vascularity and increased parenchymal stain were usually present in both groups, the vascular pattern was considerably more bizzare in the malignant tumors. Possible etiologic association of hepatic adenomas and oral contraceptives is suggested.

8946 ANGIOGRAPHIC FINDINGS IN FOCAL NODULAR HYPERPLASIA OF THE LIVER. *(Ger.)* Zurbriggen, S.; Tylen, U. (Univ. Clin., S-221 85 Lund, Sweden). *Fortschr. Geb. Roentgenstr. Nuklearmed.* 122 (5):404-409, 1975.

Hypervascularized tumors were found in the livers of four patients (3 women and 1 man, aged 17-47 yr) by celiac angiography. The male patient had a history of recurrent postprandial discomfort in the upper abdomen and was hospitalized with subicterus and increased bilirubin values. Celiac arteriography was performed because a moderate delay in transit was present in the lower duodenum on barium swallow. After surgical excision of a tumor measuring 3 x 3 cm from the right lobe of the liver, pathological examination showed it to be a focal nodular hyperplasia. Bilirubin levels remained increased and abdominal discomfort persisted postoperatively, but followup angiography eight yr postoperatively showed no evidence of a recurrence. Nodules were found in the livers of two women with no symptoms of liver disease during surgery for removal of a uterine myoma and for extrauterine pregnancy, resp.; one of these patients had taken oral contraceptives for ten yr. The first patient had angiographic evidence of a tumor in the caudal region of the liver and the second, two tumors in the left and quadrate lobes, resp. Scintigraphy with ^{99}Tc and ^{188}Au, resp., showed decreased activity in the tumor area. In the first patient, histological examiniation revealed pronounced cellular atypia and a central scar. In the second patient, both tumors were surrounded by a capsule of connective tissue and were intersected by radial septa of connective tissue. No signs of recurrence were found 12 and 30 months after tumor excision, resp. The fourth woman, who had a five-yr history of diabetes, was hospitalized with acute pancreatitis. Celiac angiography, performed to rule out a space-occupying lesion, was consistent with focal nodular hyperplasia. A liver scan was normal. The tumor was not removed, and three yr after diagnosis the patient still has no signs of liver disease.

8947 ANGIOGRAPHIC FINDINGS IN MULTIPLE BILE-DUCT HAMARTOMAS OF THE LIVER. *(E.)* McLoughlin, M. J.; Phillips, M. J. (Toronto General Hosp., Toronto, Ontario, Canada). *Radiology* 116(1): 41-43, 1975.

The angiographic appearance of the liver in a 42-yr-old man with multiple bile-duct hamartomas is described. Selective celiac and superior mesenteric angiography revealed that the left lobe of the liver was supplied by the celiac artery and the right lobe by the superior mesenteric artery. Multiple small areas of abnormal vascularity were scattered throughout both lobes, and in several areas the lesions took the form of grape-like clusters of small rings 2 to 3 mm in diameter. The angiographic differential diagnosis in this case included hepatoma, focal nodular hyperplasia, liver-cell adenoma, cavernous hemangioma, and vascular metastases. The absence of large feeding vessels, bizarre tumor vessels, laking, or arteriovenous shunting made multicentric hepatoma unlikely. Focal nodular hyperplasia and liver-cell adenoma (which range from 1 to 20 cm in diameter and are usually solitary) were also ruled out. The most difficult differential diagnosis was of multiple, highly vascular metastases. However, the appearance of clusters of small rings, much smaller and different in appearance from those formed in cavernous hemangiomas, has not been reported before. This ring pattern, which may prove to be a characteristic of bile-duct hamartoma, is attributed to the tendency of hamartomas to surround small areas of normal liver parenchyma.

8948 LIMITATIONS OF ANGIOGRAPHY AND SCANNING IN DIAGNOSIS OF LIVER MASSES. *(E.)* Lerona, P. T.; Go, R. T.; Cornell, S. H. (Section of Diagnostic Radiology, Univ. Iowa, Iowa City, Iowa). *Radiology* 112(1):139-145, 1975.

The accuracy and limitations of liver scanning and liver angiography for the determination and localization of liver masses were compared. A total of 36 proven cases of liver masses (details given; pathologic confirmation obtained by laparotomy, liver biopsy, and/or postmortem examination), which had both angiography and liver scan, formed the basis

of the research. For angiographic examination of the liver, abdominal bolus aortography in biplane projections was employed, followed by celiac selective arteriography. The percutaneous transfemoral approach and the transaxillary method were used. Celiac selective arteriograms were obtained using a No. 7 French performed catheter. Fifty to 60 ml of contrast agent (Vascoray or Renovist) were injected at 10-12 ml/sec and serial filming covered 15 sec from the start of the injection. Anterioposterior films were obtained and oblique views were taken occasionally. The radiographic technique was adjusted to the patient's size. All liver scans were done with the Ohio-Nuclear Dual Probe 5-inch crystal rectilinear scanner using the 109-hole focusing collimator. The patients were given an i.v. injection of 3 mCi of ^{99m}Tc sulfur colloid, and scanned approximately 10 to 15 min later. With the "window" setting of 30 keV, the maximum count rate was determined and scanning started using 1/16-inch line spacing. Simultaneous anterior-posterior and left-right lateral views were obtained. Of the 36 liver masses examined by both methods, the scan and the angiogram made 33 correct diagnoses each for an accuracy of almost 92%. The two methods were in agreement in 34 cases, although both had false negative results in two of these. In the two cases in which there was no agreement, the correct diagnosis was made by either angiography or the scan. The combined accuracy of both procedures was 94% in the 36 cases examined. It was concluded that liver scanning done by the method described is as accurate as angiography in the detection of liver masses; however, angiography can be more specific as to the nature of liver masses and is more accurate in their localization than the scan. The circumstances in which liver angiography following liver scanning should be done were briefly discussed.

8949 COMBINED CONTRAST AND RADIONUCLIDE ANGIOGRAPHY OF THE LIVER. *(E.)* Waxman, A. D.; Finck, E. J.; Siemsen, J. K. (Los Angeles County-Univ. Southern California Medical Center, 1200 N. State St., Los Angeles, Calif. 90033). *Radiology* 113(1):123-129, 1974.

Contrast hepatic angiography, i.v. rapid sequential liver scanning with ^{99m}Tc-sulfur, and celiac or hepatic radionuclide angiography were compared for their ability to detect intrahepatic tumors in 18 patients with suspected liver disease. Selective celiac or hepatic angiography was performed by the percutaneous transfemoral approach. Twenty to 30 ml of Hypaque-M (75%) was unjected at 15 ml/sec and films were exposed to include 30 sec from the start of contrast injection. With the catheter still in the celiac or hepatic artery, the patient was placed under an Anger camera and 10 mCi of ^{87m}Tc-sulfur was injected. From the onset of the radionuclide injection, sequential Polaroid and 70 mm films were exposed. Patients were reexamined 49 hr later using an i.v. bolus injection of 10 mCi ^{99}Tc-sulfur colloid, and Polaroid films were exposed. Intra-arterial radionuclide angiography and subsequent static scans were superior to contrast angiography in the evaluation of small avascular lesions. Radionuclide angiography was inferior to contrast angiography in evaluation of small hypervascular lesions. Large vascular or avascular lesions were detected equally well by both methods. I.v. radionuclide perfusion distribution (flow) studies were equal or slightly inferior to the intra-arterial method in detecting hepatic lesions. The i.v. radionuclide study was superior in determining arterialization of the hepatic bed. Vascular lesions of the left lobe and inferior border of the liver were better detected by the intra-arterial injection of radiocolloid than by the i.v. route. The combined use of all three techniques was superior to any single modality in evaluation of hepatic lesions.

8950 USE OF HISTOCHEMICAL TECHNIQUES FOR STUDYING ENZYMES IN BIOPSIES FOR THE DIAGNOSIS OF LIVER DISEASE. *(Ger.)* Petzold, H.; Rogos, R. (Bereich Medizin, Karl-Marx-Universitat, DDR-701 Leipzig, Johannisallee 32, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(5/6):301-305, 1974.

Histochemical determinations of adenosine triphosphatase (ATPase), acid phosphatase (AcP), alkaline phosphatase (AP), and succinate dehydrogenase (SDH) were performed in needle biopsies from 354 patients with active cirrhosis, 265 with chronic active hepatitis, 86 with chronic cholangiohepatitis, 162 with cholangitic fibrosis, 150 with infectious hepatitis, and 99 with stage I fatty liver. Since biopsies large enough for conventional histological methods were only obtained from 12% of the patients with cirrhosis, the histochemical techniques proved particularly valuable for evaluating these patients. In infectious hepatitis, ATPase activity disappeared from bile ductules and passed into Kupffer cells and sinusoids; AP activity increased in the entire lobule; and AcP activity increased, while that of SDH decreased. Normalization occurred after six wk in patients with uncomplicated infectious hepatitis. Even if conventional histological findings improved, enzyme activities did not normalize in patients with persistent hepatitis who were positive for hepatitis B antigen. Followups showed that patients often developed chronic aggressive hepatitis and cirrhosis within a few months if the cytoplasm was strongly positive for AP. In chronic aggressive hepatitis, ATPase was present only in sinusoid walls and Kupffer cells and passed into bile ductules only when hepatitis became less active. AcP was detected in peripheral sinusoid walls and was found as dark brown cytoplasmic granules in all hepatocytes. As the disease progressed, ATPase, AcP, and AP activity increased in connective tissue; an extra band appeared in serum AP isoenzymes in these patients. Although no changes in the activities of these enzymes occurred in the liver in chronic cholangitis and cholelithiasis, cholangitic fibrosis was accompanied by positive reactions for ATPase and AP in connective tissue and for cytoplasmic AP, while short, dilated, black sinusoids were found in the entire hepatic lobule. ATPase was present in many Kupffer cells and sinusoids, but in only a few bile ductules. These parenchymal reactions are so characteristic that they can be used to establish a diagnosis, even if no connective

tissue or Glisson's triangles are present in the biopsy or if only negative periportal fields are found. Although AP activity increased in all forms of fatty liver, ATPase reacted differently. No bile ductules were detected in alcoholic fatty liver, but they were present in other forms despite large deposits of fat. Connective tissue showed positive reactions for AP and AcP when fatty liver developed into cirrhosis. As fatty liver regressed, ATPase activity decreased in a large number of bile ductules and sinusoids, and Kupffer cells became smaller. AP first disappeared from the intermediate part of sinusoids and then in the center of the lobule. AcP was present as bands of dark brown granules, and SDH activity increased later. These same changes in enzyme activity occurred in connective tissue.

8951 IMMUNOFLUORESCENT DETECTION OF α_1-ANTITRYPSIN IN PARAFFIN EMBEDDED LIVER TISSUE. *(E.)* Ray, M. B.; Desmet, V. J. (Departement Medische Navorsing, Academisch Ziekenhuis Sint-Rafael, B-3000 Leuven, Belgium). *J. Clin. Pathol.* 28(9):717-721, 1975.

The ability of the indirect immunofluorescent technique to detect α_1-antitrypsin was investigated in Bouin-fixed, paraffin-embedded liver tissue from patients with established or suspected α_1-antitrypsin deficiency. The technique was applied on both frozen and paraffin sections of liver biopsies from three patients with clinically and biochemically proven α_1-antitrypsin deficiency; on paraffin sections of liver biopsies from four patients with PAS-positive, diastase-resistant inclusions in hepatocytes; and on frozen and paraffin sections of liver tissue from six control patients with other liver diseases. α_1-Antitrypsin was detected in both frozen specimens and paraffin sections of the three patients with proven α_1-antitrypsin deficiency and in the four biopsies with PAS-positive inclusions. Of the seven positive biopsies, three were diagnosed as cirrhosis and four as periportal vesicular steatosis. All positive biopsies showed bright fluorescence in the cytoplasm of the liver cells, although one of the biopsies had been stored for eight yr. Specific fluorescence was constantly detected in the periportal hepatocytes with varying degrees of positivity. The cellular location and the brightness of the fluorescence were the same in frozen and paraffin sections. No fluorescence was observed in the six control biopsies. These findings demonstrate that paraffin-embedded specimens are suitable for immunofluorescent detection of α_1-antitrypsin and that a retrospective study on old paraffin blocks is possible.

8952 GALLIUM-67-CITRATE SCANNING IN PRIMARY CANCER OF THE LIVER: DIAGNOSTIC VALUE IN THE PRESENCE OF CIRRHOSIS AND RELATION TO ALPHA-FETOPROTEIN. *(E.)* Levin, J.; Kew, M. C. (Johannesburg General Hosp., University of the Witwatersrand, and South Africa Primary Liver Cancer Res. Unit, Johannesburg, South Africa). *J. Nucl. Med.* 16(10): 949-951, 1975.

The usefulness of ^{67}Ga scanning and the correlation of radionuclide uptake and alpha-fetoprotein synthesis in cases of primary hepatocellular cancer associated with cirrhosis were investigated. Gallium-67-citrate and ^{99m}Tc-sulfur colloid scans were performed in 38 untreated Negro patients with histologically proven primary hepatocellular cancer. Posterior, anterior, and right lateral scans were recorded and comparatively studied. The presence or absence of cirrhosis was determined at necropsy, laparotomy, or by percutaneous biopsy and sera were tested for alpha-fetoprotein by immunodiffusion. In 70% of the patients, the ^{67}Ga was selectively taken up by the defect(s) seen on the ^{99m}Tc-sulfur colloid scan. Selective uptake of ^{67}Ga occurred in 66% of the 18 patients with cirrhosis, and in 72% of the 13 without cirrhosis. However, no explanation was offered for the false-negative scanning results in 30% of the patients. Alpha-fetoprotein detected in 68% of the patients suggested a slight correlation with selective uptake of the radionuclide; this contrasts with previously reported results.

8953 THE ACCURACY OF LIVER SCANNING IN THE DETECTION OF METASTATIC DISEASE. *(E.)* Kilgore, E. S.; Calabretta, A. M.; Weidner, W. A.; Graham, W. P. (Milton S. Hershey Medical Center of the Pennsylvania State Univ., Hershey, Pa.). *J. Surg. Oncol.* 7(5):351-354, 1975.

To determine accuracy of the liver scan as a diagnostic tool in detecting hepatic metastases, the records of 429 patients who had undergone liver scanning with technetium 99m sulfur colloid were reviewed. Of these patients, 125 had a confirmatory procedure (needle biopsy in 15 patients, abdominal exploration in 69, and autopsy in 41) done within six weeks of their scan. Nineteen patients who had negative scans were proven to have hepatic metastases. Fourteen patients had positive scans, which could not be substantiated by one or more of the above confirming examinations. It is concluded that such scanning proved sufficiently inaccurate to preclude its use in the routine evaluation of metastatic disease.

8954 WEDGED HEPATIC VENOGRAPHY IN PATIENTS WITH END-TO-SIDE PORTACAVAL SHUNTS. *(E.)* Reuter, S. R.; Orloff, M. J. (Depts. Radiology and Surgery, Univ. California, San Diego, Calif.). *Radiology* 111(3):563-566, 1975.

Wedged hepatic venograms in five patients with end-to-side portacaval shunts were evaluated for: sinusoidal filling pattern; the presence of portal veins and hepatic vein filling; the direction of washout of contrast medium; and the presence of collateral veins between the hepatic and splanchnic sides of the shunt. The sinusoidal filling pattern was relatively homogeneous in one patient, moderately nonhomogeneous in three, and had a nodular appearance in one. Portal vein filling occurred in all patients but hepatic vein filling in only one. In three patients with portal vein filling, the con-

trast medium washed out in a peripheral hepatopetal direction. Collateral veins were present between the hepatic and splanchnic sides of the shunt in all patients. In four of the five, the communication was between the cystic vein *via* the pancreaticoduodenal vein to the superior mesenteric vein. The contrast medium entered the superior mesenteric vein in two of these four patients; the washout was in a central hepatofugal direction. In the fifth patient, a capsular collateral vein had developed between the inferior edge of the right lobe of the liver and the gastroepiploic vein. It is concluded that collateral blood flow develops between the portal and splanchnic limbs of end-to-side portacaval shunts through cystic and pancreaticoduodenal veins because of the residual elevated pressure on the portal side of the ligature. The blood flow in the portal vein may be either hepatopetal or hepatofugal, probably depending on the overall resistance in the hepatic veins at time of surgery.

8955 PRELIMINARY RESULTS OF A TRIAL IN AMOEBIC LIVER ABSCESS. *(E.)* Meyer, H. A. (Kilimanjaro Christian Medical Center, Moshi, Africa). *East Afr. Med. J.* 51(9):923-927, 1974.

The 'Serameba' latex agglutination test was compared with the immunofluorescence antibody test, and subsequent treatment with tinidazole was evaluated. As the clinical findings in amebic liver abscess were noted to be extremely varied, the diagnostic value of the latex agglutination test and the dry blood sample technique for immunofluorescence antibody testing was evaluated in 26 patients with hepatic amebiasis. The clinical diagnosis and aspiration results were tentatively correlated with the test values. Patients with positive aspiration results showed a trend to higher titers in the immunofluorescence antibody and latex agglutination tests. The dry blood sample modification appeared less sensitive, yet useful in the confirmation of diagnosis. Seventeen patients with clinical and serological evidence of hepatic amebiasis were administered p.o. tinidazole, 2 mg/day, for two to three days. Twelve patients were cured, two improved and were eventually cured, and three required additional metronidazole. The oral tolerance was good; side-effects included nausea, paresthesia of the hands, moderate ataxia of the legs, and raised alkaline phosphatase levels. There were miscellaneous benign complaints, including dizziness, headache, and itching. No relapses or cardiotoxicity were detected. It is concluded that tinidazole is both effective and well tolerated in the dosage tested.

8956 HEPATIC "INTRAVENOUS FAT PIGMENT" IN INFANTS AND CHILDREN RECEIVING LIPID EMULSION. *(E.)* Koga, Y.; Swanson, V. L.; Hays, D. M. (Children's Hosp. of Los Angeles, Los Angeles, Calif. 90027). *J. Pediatr. Surg.* 10(5):641-648, 1975.

The deposition of fat pigment in the liver was evaluated retrospectively in 23 infants and children (10 females and 13 males) who had received a soybean emulsion (Intralipid) i.v. and for whom complete autopsic records were available. Pigment was found in hepatic cells (HC) in 14 of the 23 patients and in reticuloendothelial cells (REC) in 22 cases. One of eight patients older than four yr at the time of infusion of fat emulsion had pigment in HC, while ten of 15 patients younger than four yr had significant pigment deposition. Ten of 14 patients with acute abdominal diseases (e.g., peritonitis, intestinal perforation, ruptured omphalocele) had increased pigment in HC compared with three of nine patients without such conditions. Patients infused with emulsion at rates less than 0.5 g/kg/hr had less pigment deposition than patients infused at faster rates. Neonates infused at rates less than 0.2 g/kg/hr for 24 hr had less HC than those infused at higher rates. The quantity of REC pigment bore no apparent relation to age, clinical diagnosis, rate or total dose of fat emulsion, but was increased in groups infused for more than 14 days. The HC pigment varied from the REC pigment in its generally faint anisotropy and distinctly positive staining with PAS, indirect fuchsin, and phospholipid stains. The HC pigment most closely resembles lipofuscin. The cause of this pigment deposition is unknown but may be related to immaturity of an enzyme system or vitamin E deficiency.

8957 ULTRASTRUCTURAL FEATURES OF THE LIVER DURING TREATMENT WITH ORAL CONTRACEPTIVES. *(It.)* Cirri, G. P.; Paci, P. (Instituto Anatomia Istologia Patologica, Universita Firenza, Italy). *Patol. Clin. Obstet. Ginecol.* 3(1):30-37, 1975.

Electron microscope examinations were performed on needle biopsies from the livers of two women, aged 29 and 24 yr, resp., with cholestatic jaundice induced by an oral contraceptive containing 2.5 mg of lynestrenol and 0.075 mg of mestranol. Cholestatic jaundice developed after nine days and seven months of treatment, resp., and lasted about 30 and 60 days, resp. In both cases, the bile tubules were dilated and their lumina were partially or completely filled with an amorphous, electronopaque material. Lipofuscin-type pigments and bile pigments were present at the bile pole of the hepatocytes or, in some cases, were dispersed throughout the cytoplasm. Mitochondria were irregularly shaped and some contained paracrystalline inclusions oriented along the longer axis of the organelle. The vacuolar component of the Golgi apparatus contained extremely electronopaque material, and the smooth endoplasmic reticulum was highly developed, tending to microvesiculation in some cases. Kupffer cells showed morphological evidence of intense activation. These findings were more pronounced in the second patient, who had more severe jaundice of longer duration than that of the first patient. In addition, signs of regeneration were clearly evident in the biopsy from the second patient. Changes found at the vascular pole of the hepatocytes and in intercellular spaces were very interesting. In both patients, Disse's spaces were dilated and filled with an amorphous, electronopaque material and, in some cases, with bundles of collagen fiber. These changes are manifestations of functional impairment of the vascular pole, resulting in a decrease in the rate of trans-

port between blood and tissues. This situation might account for the presence in the second biopsy of cellular diastasis in the hepatic parenchyma. This was accompanied by the appearance of microvilli along the sides of the plasmalemma of two adjacent hepatocytes. These changes are generally considered to be a manifestation of functional compensation to ensure that the hepatocyte has a surface large enough for transport of nutrients. Changes in Disse's spaces obstruct this transport. The changes described here are not specific for cholestatic jaundice induced by oral contraceptives, but are also found in patients with cholestatis of pregnancy and those with cholestatic jaundice induced by anabolic agents.

8958 LIVER FUNCTION TESTS AFTER TREATMENT WITH THE ORAL CONTRACEPTIVE, DEPOSISTON, FOR SIX MONTHS. *(Ger.)* Brugmann, E.; Goretzlehner, G.; Towe, J.; Rehpenning, W. (Bereich Medizin, Universitat Rostock, Germany). *Zentralbl. Gynaekol.* 97 (11):669-673, 1975.

Liver function was studied in 18 women, aged 17 to 38 yr, who were given Deposiston (1 mg of 17α-ethynyl-3-*iso*propylsulfonylhydroxyestradiol on days 4, 11, and 18 of the menstrual cycle and 10 mg of norethisterone acetate on day 25). At the end of two cycles of treatment, only a decrease in SGPT had occurred which was of borderline significance. By the end of six cycles of treatment, values for the thymol turbidity test and total serum protein and serum albumin concentrations had decreased; these changes were of borderline significance. Significant increases occurred in α_1- and β-globulin concentrations and the serum cholesterol level. The half-time for indocyanine green excretion was also increased, but no pathological significance could be attached to this finding. To obtain definitive information on the effect of Deposiston on liver function, it will be necessary to continue these studies for a longer period.

8959 ACUTE LIVER FAILURE: A METHOD OF ARTIFICIAL SUPPORT. *(It.)* Williams, R. (King's Coll. Hosp. Medical Sch., London, England). *Minerva Chir.* 29(18):968-973, 1974.

Hepatic necrosis was induced in dogs by portacaval shunt surgery followed by ligation of the hepatic artery. Blood from these dogs was perfused through columns containing charcoal to adsorb water-soluble toxic compounds or through an ion-exchange resin to remove toxic compounds conjugated to protein. In comparison to controls, dogs whose blood was perfused through charcoal columns survived significantly longer. Those whose blood was perfused through ion-exchange resin survived longer than controls, but the difference was not significant. Blood ammonia levels gradually increased in controls, but not in dogs whose blood was perfused through charcoal. While serum bilirubin levels gradually increased in controls, bilirubin levels decreased significantly in dogs whose blood was perfused through the resin. The main problem with this technique was that the charcoal and resin removed platelets and WBC from the blood as well as toxic substances. Absorption of platelets was prevented by coating the charcoal with a special material which still permitted adsorption of water-soluble compounds. However, perfusion of blood through the resin caused such a marked decrease in the platelet count that dogs treated by this method did not survive as long as dogs whose blood was perfused through charcoal; many of those in the former group died of hemorrhages. Recently, patients with stage 4 hepatic coma caused by halothane, viral hepatitis, *Amanita phalloides* intoxication, and other factors have been treated by perfusing their blood through a carbon column after they failed to respond to other forms of therapy. Dialysis was performed for 4 to 5 hr/day, and patients were kept on the artificial liver for periods of four to six days. Four of the six patients survived and are in good health. Two died: one as a result of the coma and the other of a hemorrhage. None of these patients regained consciousness before they had undergone three courses of treatment on the liver machine. This is probably due to accumulation of toxic metabolites in the brain. Consequently, the method of artificial support should be capable of prolonged, repeated and reproducible operation.

8960 USE OF DIALYSIS IN THE TREATMENT OF RENAL FAILURE IN LIVER DISEASE. *(E.)* Parsons, V.; Wilkinson, S. P.; Weston, M. J. (King's Coll. Hosp., Denmark Hill, London, S.E. 5, England). *Postgrad. Med. J.* 51(598):515-520, 1975.

Indications for dialysis in patients with hepatorenal failure are reviewed together with the management of dialysis patients with severe hyponatremia, hypocalcemia, hypophosphatemia, and alkalosis. The administration of calories, insulin, anticoagulants, and antibiotics, the types of dialysis to be used, and the correction of pulmonary and cardiac complications during dialysis are also discussed. Results of dialysis in 55 patients with combined hepatic and renal failure are given by disease type and method of dialysis. Mortality was 75% in 16 patients treated by hemodialysis alone, 76% in 33 patients treated by peritoneal dialysis alone, and 50% in six patients treated by both methods combined. None of 14 patients with end-stage liver failure due to cirrhosis survived, and mortality was 78% in 22 patients with fulminant-hepatic failure. All five patients with severe hyperbilirubinemia due to biliary tract obstruction (with oliguric or anuric renal failure) survived. It is concluded that dialysis should be reserved for the correction of fluid and electrolyte problems in patients with obstructive jaundice, those whose hepatic failure has some chance of recovery, and/or those who are awaiting hepatic transplantation.

8961 HEPATIC SUPPORT BY CROSSED CIRCULATION BETWEEN HUMANS: SIX CASES. *(It.)* Motin, J.; Bouletreau, P.; Petit, P.; Latarjet, J. (Edouard Herriot Hosp., Lyon, France). *Minerva Chir.* 29(18): 989-993, 1974.

Crossed circulation was used to treat four males and two females (aged 9 to 42 yr) with hepatic coma (stage III) developing seven days or less after the onset of jaundice. The jaundice was accompanied by prothrombin values lower than 20%, as well as signs of disseminated intravascular coagulation; and by cytolysis of 70% or more in needle biopsies performed after exchange transfusions or injection of Stuart's prothrombin-proconvertin factor and antihemophilic factor B. In three patients, an arteriovenous shunt was placed between distal blood vessels of the extremities, and a double-headed roller pump was inserted into the circuit between the donor and recipient to permit regulation of flow. A higher flow rate (6-12 ml/min/kg) was obtained in three patients with an arterial-arterial shunt between the superficial femoral arteries. Of the six patients treated in this way, three died in hepatic coma without regaining consciousness although one patient had histological evidence of hepatic regeneration. One of these three patients died of acute pulmonary edema. Of the two patients who recovered, one was a 39-yr-old woman who failed to respond to glucose, coenzyme A, cocarboxylase, lipoic acid, or γ-globulin. In less than 12 hr after institution of crossed circulation, clotting factors increased to 50% and bilirubin levels dropped. Improvements in the electroencephalogram occurred after 12 hr, the patient responded to pain and noise after 36 hr, and 70% of the hepatic parenchyma had regenerated after 84 hr. She regained consciousness after 108 hr and crossed circulation was discontinued after 114 hr for technical reasons. The condition of the patient deteriorated, both neurologically and biologically, but she responded to symptomatic treatment and is alive and well four yr later. The second patient who recovered was a nine-yr-old girl who regained consciousness 12 hr after institution of crossed circulation. Crossed circulation had to be discontinued after 47 hr because the patient developed *Escherichia coli* septicemia from an exposed fracture on the donor's leg. She still had cholestatic jaundice after three months and was treated with corticosteroids. The jaundice disappeared after four months and the patient is alive and well after 18 months; all laboratory tests and a liver biopsy were normal.

8962 HEPATIC ARTERY LIGATION FOR EXSANGUINATING LIVER INJURIES IN CHILDREN. *(E.)* Canty, T. G.; Aaron, W. S. (Univ. Louisville, Sch. Medicine, Louisville, Ky.). *J. Pediatr. Surg.* 10(5):693-700, 1975.

Selective right hepatic dearterialization was performed in two boys (aged 2.5 and 7 yr) with bursting and exsanguinating injuries of the right lobe of the liver secondary to blunt trauma. The first child was in profound shock. Selective dearterialization by ligation of the right hepatic artery distal to the cystic artery was performed with immediate cessation of blood loss from the posterior dome of the right liver lobe, rapid return to normotensive state, and return of urine output. The second child presented with arterial bleeding from a laceration on the undersurface of the right liver lobe. The cyctic artery was noted to come off the right hepatic as it entered the liver in the porta. Right hepatic artery ligation proximal to the origin of the cyctic artery resulted in immediate and complete cessation of bleeding. Neither child underwent simultaneous cholecystectomy and T-tube drainage of the extrahepatic biliary tree. Both children tolerated the ligation procedure quite well; each showed transient elevation of liver enzymes, suggesting minimal ischemia, with a gradual return to normal. Revascularization was demonstrated in the first case four days after ligation. Despite postoperative complications related to severe pulmonary injuries, the children were discharged on the 11th and 17th days after injury, resp. Follow-up studies at nine and 21 months showed normal liver function tests, normal oral cholecystogram, chest x-ray, and hepatic scintiscan.

8963 DISTRIBUTION OF ALKALINE PHOSPHATASE ACTIVITY IN HEALTHY AND DISEASED HUMAN LIVER TISSUE. *(E.)* Hagerstrand, I. (Malmo General Hosp., 21401 Malmo S, Sweden). *Acta Pathol. Microbiol. Scand.* [A] 83(5):519-526, 1975.

Alkaline phosphatase activity in paraffin-embedded sections of 820 human liver biopsies was determined with an azo-dye method. The specimens were obtained from 102 subjects without liver disease, 161 subjects with acute hepatitis, 95 with chronic hepatitis, 68 with extrahepatic obstruction, 126 with cirrhosis, 109 with steatosis, and 50 with primary or secondary malignancies of mainly epithelial origin. Three specimens that contained α_1-antitrypsin deposits and 74 that showed only negligible morphologic changes (mild cholestasis, other pigment deposits, slight fibrosis) were also studied. Alkaline phosphatase activity of healthy human liver tissue was confined to vessel walls and to sinusoids, especially those around central veins. Faint canalicular staining was detected in only 20 of the 102 healthy specimens. Increased sinusoidal alkaline phosphatase activity was seen in acute hepatitis, chronic aggressive hepatitis, extrahepatic obstruction, cirrhosis, and malignant tumors. A patchy canalicular staining was fairly common in chronic aggressive hepatitis, cirrhosis, and extrahepatic obstruction, but more pronounced canalicular staining appeared mainly in the specimens containing malignant tissue. Thirty-eight of the 50 malignant specimens showed intense staining of both perifocal and remote canalicular structures. Intense canalicular staining also occurred in specimens from three patients with extrahepatic obstruction due to malignant growths and from five with obstruction due to stones. An isolated, diffuse canalicular reaction was seen in two of the three specimens with α_1-antitrypsin deposits, in 15 of the 72 with minor morphologic changes, and in all of 34 additional specimens of normal histologic appearance. Two of the latter came from patients with renal carcinoma without liver metastases. These results show that alkaline phosphatase activity in sinusoids is increased in various liver diseases but that appreciable canalicular activity is most prominent in parenchyma involved by malignant tumors.

8964 CHARACTERIZATION OF α_1-ANTITRYPSIN IN THE INCLUSION BODIES FROM THE LIVER IN α_1-ANTITRYPSIN DEFICIENCY. *(E.)* Jeppson, J. O.; Larsson, C.; Eriksson, S. (Malmö General Hosp., Malmö, Sweden). *New Engl. J. Med.* 293(12):576-579, 1975.

α_1-Antitrypsin was isolated from PAS-positive inclusion bodies from the hepatocytes of patients with α_1-antitrypsin deficiency and further purified to enable more detailed chemical analysis. This analysis included cyanogen bromide degradation, polyacrylamide gel electrophoresis, amino acid analysis, gas chromatographic analysis of the carbohydrates, and determinations of sialic acid and total neutral sugars. Electrophoresis showed a small but consistent difference in molecular size between serum α_1-antitrypsin (Pi^{MM}, 56,000 daltons) and liver α_1-antitrypsin (50,000 daltons). Further characterization with electrofocussing of the fragments obtained after cyanogen bromide degradation revealed a pattern similar to that of serum α_1-antitrypsin of Pi^{ZZ} type and different from that of the Pi^{MM} type. With the exception of arginine and phenylalanine, the amino acid compositions of the liver protein and serum α_1-antitrypsin (Pi^{MM}) were similar. Carbohydrate analysis showed a complete lack of sialic acid in the liver protein, and the levels of other monosaccharides were low in the liver as compared with the serum protein. The data indicate that the accumulation of hepatic globules in α_1-antitrypsin deficiency is probably related to the physical properties of the defective antitrypsin, which include marked insolubility and a tendency toward aggregation. They strongly suggest an abnormal amino acid sequence in the peptide chain of the deficient antitrypsin. The interference with glycosylation in α_1-antitrypsin deficiency may be related to steric hindrance.

8965 THE MORPHOLOGY OF INTRA- AND EXTRAHEPATIC BILIARY DISEASE. *(Ger.)* Wohlgemuth, B.; Reichmann, J. (Bereich Medizin, Karl-Marx-Universitat, DDR-701 Leipzig, Liebigstrasse 26, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(5/6):313-317, 1974.

Pathological changes were found in the biliary tracts of 1475 (54%) of a total of 2732 autopsied patients. These changes were present in 896 women (66.8%) and 579 men (33.5%). Biliary disease was the direct or indirect cause of death in 147 cases (5.4%): uncomplicated cholelithiasis in 19 cases; cholelithiasis with cholecystitis in 40; carcinomas of the biliary tract in 70; and sequelae of cholecystectomy in 18. Both cholelithiasis, with and without cholecystitis, and cholesteatosis were most common in patients over 70-yr-old. Malignant tumors were more common in women (50 cases) than in men (20 cases): in women, they consisted of carcinomas of the gallbladder (37), bile ducts (10), and papilla (3), and in men, carcinomas of the gallbladder (9), bile ducts (9), and papilla (2). Of these cancer patients, 41 women and 13 men also had cholelithiasis. All but two cancer patients were in the seventh or eighth decade of life. In three cases, differences were found in the thickness of the biliary tract in conjunction with an initial increase and later rarefaction of elastic fibers. Cholelithiasis resulted in hypertrophy and choledocholithiasis, superficial epithelial defects, and intramural cicatrization with disorganization and disappearance of elastic elements. These changes, which had deleterious effects on motility and immune defense, are regarded as irreversible. In patients with pronounced extrahepatic cholangitis, thick inflammatory infiltrates and lesions of the wall containing deposits of bile pigment were detected. The labeling index with ^{3}H-thymidine was increased eight-to-nine fold over that found in controls, but the epithelium in the extrahepatic biliary tract showed no evidence of increased proliferation. It is considered that increased labeling of intramural fibroblasts is a manifestation of increased fiber production.

8966 ULTRASTRUCTURAL AND MORPHOMETRIC STUDY OF LIVER BIOPSIES FROM PATIENTS WITH INTRAHEPATIC CHOLESTASIS. I. CORRELATIONS BETWEEN MORPHOMETRIC PARAMETERS OF THE BILE CANALICULI AND THE MARKER ENZYMES OF CHOLESTASIS. *(Ger.)* Roessner, A.; van Husen, N.; Pauls, E.; Gerlach, U.; Themann, H. (Medizinische Universitatsklinik Poliklinik, Westfalische Wilhems-Universitat, D-4400 Munster, Westring 3, Germany). *Virchows Arch. [Pathol. Anat.]* 367(1):15-26, 1975.

The volume and surface area of bile canaliculi, expressed as a percentage of the liver volume, and the number of bile canaliculi/electron micrograph were measured in hepatic biopsies obtained with a Menghini needle from 40 patients with intrahepatic cholestasis. Activities of leucine aminopeptidase, 5'-nucleotidase, total alkaline phosphatase, "bile duct" phosphatase, and total bilirubin concentrations were measured in serum from these patients. Intrahepatic cholestasis was diagnosed clinically and was confirmed by increases in marker enzymes of cholestasis; "hepatocyte" phosphatase was increased in the serum in all cases. Statistically significant correlations were found between bile canaliculi ultrastructure and serum leucine aminopeptidase and 5'-nucleotidase activities. The volume of bile canaliculi was significantly increased in patients with increased serum leucine animopeptidase activities, while the number of bile canaliculi was significantly increased in patients with increased serum 5'-nucleotidase activities. Increases in "bile duct" phosphatase, an isoenzyme of alkaline phosphatase, were accompanied by increases in the number of bile canaliculi and in the volume of bile canaliculi, but these correlations were not significant. No correlations were found between bile canaliculi ultrastructure and total alkaline phosphatase activity or total serum bilirubin.

8967 FETAL BILE ACID LEVELS IN PREGNANCIES COMPLICATED BY MATERNAL INTRAHEPATIC CHOLESTASIS. *(E.)* Laatikainen, T. J. (Univ. Central Hosp., Haartmaninkatu 2, SF-00290, Helsinki 29, Finland). *Am. J. Obstet. Gynecol.* 122(7):852-856, 1975.

The influence of maternal intrahepatic cholestasis on fetal bile acid levels was investigated. Serum samples from 42 cases of intrahepatic cholestasis in pregnancy were compared with 20 cord plasma samples from uncomplicated pregnancies serving as controls. Cholic acid (CA) and chenodeoxycholic acid (CDC) levels were determined using gas-liquid chromatography (GLC) and gas chromatography-mass spectrometry (GC-MS). In the control group, the CDC levels averaged 0.88 µg/ml and CA levels averaged 0.94 µg/ml. The cholestasis group showed mean levels of 1.90 µg/ml of CDC and 3.74 µg/ml of CA. The concentrations of both bile acids were highest in maternal blood. There was a positive correlation between the amount of pregnanediol disulfates (2.5-7.0 µg/ml) and the total amount of bile acids. A negative correlation was found between the 16-oxygenated steroid sulfates (1.0-2.5 µg/ml) and bile acids in fetal blood. An increased occurrence of various signs of fetal distress was noted in the cholestasis group, including: green amniotic fluid, abnormal heart rates, and/or abnormal heart rate patterns. There was a perinatal mortality rate of 6.4%. These findings support the opinion that maternal cholestasis may jeopardize fetal well-being.

8968 THE METABOLISM OF 3α, 7α, 12α-TRIHYDROXY-5β-CHOLESTAN-26-OIC ACID IN TWO SIBLINGS WITH CHOLESTASIS DUE TO INTRAHEPATIC BILE DUCT ANOMALIES. AN APPARENT INBORN ERROR OF CHOLIC ACID SYNTHESIS. *(E.)* Hanson, R. F.; Isenberg, J. N.; Williams, G. C.; Hachey, D.; Szczepanik, P.; Klein, P. D.; Sharp, H. L. (Univ. Minnesota Hosp., Minneapolis, Minn. 55455). *J. Clin. Invest.* 56(3):577-587, 1975.

Studies were carried out in a family in which two children suffered from cholestasis resulting from intrahepatic bile duct anomalies. Each child had increased amounts of the cholic acid precursor, 3α, 7α, 12α-trihydroxy-5β-cholestan-26-oic acid (THCA). THCA was tentatively identified in the serum, bile, and urine by gas liquid chromatographic mobilities and confirmed by mass spectroscopy. In one of these patients the metabolism of THCA was studied after an i.v. injection of (^{3}H)THCA. This study revealed that the cause of the increased amount of THCA in this condition was due to a metabolic defect in the conversion of this compound into cholic acid. After (^{3}H)THCA administration, a small amount of (^{3}H)cholic acid was also identified, thus confirming that this metabolic defect was incomplete. In neither of these patients could varanic acid, a metabolite of THCA, be identified. This finding allows the suggestion that the defect in these patients seems due to a deficiency of a 24-hydroxylating enzyme system required to convert THCA into varanic acid. It is suggested that this condition is transmitted in an autosomal recessive fashion, as the two affected patients were of opposite sex, and neither a normal sibling nor the two parents had increased amounts of THCA in their bile.

8969 CONGENITAL FIBROSIS OF THE LIVER, A MESENCHYMATOUS EMBRYOPATHY? *(Fr.)* Moyson, F. (Service de Chirurgie Pediatric et d'Orthopedie, Hopital Universitaire Brugmann, Bruxelles, Belgique). *Ann. Chir. Infant.* 15(6):505-513, 1974.

Congenital fibrosis of the liver (CFL) is usually found in children younger than six yr. The symptoms of CFL are hepatomegaly with or without hematemesis. No change in hepatic function is observed. Death results in 50% of the cases and is usually a result of hemorrhage or uremia. In a nine-yr-old female patient, normal tissue with hyperplasia of fibrous material was found in both the kidney and the liver. This hyperplasia was accompanied by numerous dilated excretory canals and hypoplasia of the veins and lymphatic canals. CFL was a result of both cellular differentiation, which is under genetic control, and histogenic differentiation, determined by the environment. The mesoderm surrounding the extrahepatic biliary ducts penetrated the liver following the branches of the portal vein. CFL was the result of hyperplasia which did not affect the hepatocytes but permanently damaged the renal cells. Abnormal proliferation of fibrous tissue in hip cartilage, excessive concentrations of hydroxyproline in the urine, Scheuermann's disease and follicular hyperkeratosis often accompanied CFL. Embryological, histological and biochemical findings suggest that CFL results from a mesenchymatous embryopathy.

8970 TRANSFUSIONAL IRON OVERLOAD: THE RELATIONSHIP BETWEEN TISSUE IRON CONCENTRATION AND HEPATIC FIBROSIS IN THALASSAEMIA. (E.) Risdon, R. A.; Barry, M.; Flynn, D. M. (Hosp. Sick Children, Great Ormond St., London WC1N 3JH, England). *J. Pathol.* 116(2):83-96, 1975.

The interrelation of liver iron concentration, the duration of iron-loading, and hepatic fibrosis (assessed morphometrically) were studied in 32 liver specimens obtained from 19 heavily transfused patients (aged 4-19 yr) with thalassemia major. Similar observations were made in a matched group of thalassemic patients who had undergone long-term chelation therapy. The degree of liver damage ranged from a very slight increase in fibrous tissue to severe fibrosis and cirrhosis. The severity of fibrosis was closely correlated both with the liver iron concentration and with age. While the relation between fibrosis and age was linear, both the severity and rate of fibrosis were exponentially related to the liver iron concentration. The damage accelerated as the liver iron concentration exceeded 3% dry weight. By producing a modest but significant reduction in the liver iron concentration, chelation therapy resulted in a disproportionate but predictable retardation in the progression of the fibrosis. In general, stainable iron was uniformly distributed between the parenchymal and reticuloendothelial cells during the early stages of iron loading. Parenchymal siderosis was relatively heavier in splenectomized patients and in patients with liver iron concentrations greater than 3% dry weight than in nonsplenectomized patients and those with liver iron levels less than 3% dry weight, but this did not affect the severity of the fibrosis. The data suggest that the iron excess in the thalassemic patients was largely, if not entirely, derived from the large amounts of blood they had received since

infancy, and that increased iron absorption is not a significant factor in their iron accumulation. The data also suggest that the relatively mild fibrosis generally found in patients with transfusional siderosis may reflect only the limited survival of these subjects. Thus, while cirrhosis and long-continuing hyperabsorption of iron are associated in certain hyperplastic erythroid states, this is a self-selecting situation in that such patients have had disease mild enough to permit prolonged survival with little or no need for transfusion.

8971 CLINICAL OBSERVATIONS DURING A RELATIVELY EARLY STAGE OF HEPATOCELLULAR CARCINOMA, WITH SPECIAL REFERENCE TO SERUM α-FETOPROTEIN LEVELS. *(E.)* Okuda, K.; Kotoda, K.; Obata, H.; Hayashi, N.; Hisamitsu, T.; Tamiya, M.; Kubo, Y.; Yakushiji, F.; Nagata, E.; Jinnouchi, S.; Shimokawa, Y. (Chiba Univ. Hosp., Chiba 280, Japan). *Gastroenterology* 69(1):226-234, 1975.

Five cases of early hepatocellular carcinoma were analyzed using the α-fetoprotein (AFP) assay. Case I was a 46-yr-old man admitted with diabetes mellitus and abnormal liver function. The level of blood SGOT was 130 Karmen U, SGPT was 145 Karmen U, bilirubin was 0.8 mg, and HBsAg and anti-HBs tests were negative. The AFP level rose from 3 to 10,800 ng/ml in six months. A celiac angiography showed a small lesion in the right lobe. Lobectomy revealed a differentiated, grade II, hepatocellular carcinoma. The AFP level decreased to 9 ng/ml by seven months post-surgery, with no recurrence. Case II was a 68-yr-old male admitted with jaundice. A needle biopsy revealed chronic active hepatitis. The level of SGOT was 52 Karmen U, SGPT was 31 Karmen U, a bromosulfophthalein test showed a 21% retention at 30 min. The AFP level rose from 18 to 1200 ng/ml within one month. The test for HBsAg was positive. A right hepatic resection was performed. The tumor recurred and the patient expired. Case III was a 55-yr-old male admitted with abnormal liver tests. Chronic active hepatitis was diagnosed. Biopsy revealed no neoplasm but there was some splenic action on laparoscopy. After three months, the SGOT level rose to 300 Karmen U and the AFP level rose to 1500 ng/ml. The patient expired from hepatic failure. Case IV was a 54-yr-old man admitted with chronic hepatitis complicating schistosomiasis japonica. The RBC count was 3,310,000/mm^3, bilirubin was 2.8 mg, SGOT was 98 Karmen U, SGPT was 42 Karmen U, the AFP level was 463 mg/ml, and an HBsAg test was positive. The patient expired from cirrhosis and hepatocellular carcinoma. Case V was a 71-yr-old alcoholic with hepatomegaly; the blood chemistry was unremarkable. Celiac angiography revealed hepatocellular carcinoma. AFP remained constant at 5 ng/ml; the patient expired after five yr. Generally, the change in AFP level was found to be most important in assessing tumor growth. The correlation between rising AFP and positive HBsAg may be due to destruction of normal tissues by the expanding tumor.

8972 HEPATIC PORTAL VEIN GAS WITHOUT BOWEL INFARCTION OR NECROSIS. *(E.)* Tedesco, F. J.; Stanley, R. J. (Washington Univ. Sch. Medicine, St. Louis, Mo. 63110). *Gastroenterology* 69(1):240-243, 1975.

A case of intramural bowel gas and hepatic portal vein gas without necrotic or infarcted bowel or intestinal pneumatosis is reported. A 56-yr-old white female underwent a total gastrectomy for Zollinger-Ellison syndrome. The lower esophagus was found to be very thin-walled and markedly structured and was ligated because of a linear tear in the anterior portion made during the dissection. In addition, a proximal jejunal ulcer was removed, an end-to-end anastomosis was carried out, and a cervical esophagostomy and a feeding jejunostomy were performed. On the tenth postoperative day, severe abdominal pain with rebound tenderness resulted in re-exploration, and a distal esophageal perforation was oversewn. The patient was started on gentamicin and clindamycin, but 12 days later developed severe abdominal pain, decreased bowel sounds, and abdominal distention. Radiographs revealed intramural bowel gas and hepatic portal vein gas. At exploration, two i.p. abscesses were found and drained, but the bowel appeared normal. A second radiograph failed to disclose evidence of persistent intramural or portal vein gas or significant bowel distention. Blood cultures were negative, and the subsequent hospital course was unremarkable. The patient was doing well at followup six wk later. The data in this case suggest the entry of gas-forming organisms into the mesenteric venous system secondary to abscess.

8973 FUNCTIONAL AND MORPHOLOGICAL ASPECTS OF THE LIVER IN IDIOPATHIC AND SECONDARY HAEMOCHROMATOSIS. *(Fr.)* Naccarato, R.; Rizzo, A.; Sirigu, F.; Polin, R. (Istituto di Patologia speciale medica e Metodologia clinica dell'Universita di Padova, Italy). *Med. Chir. Dig.* 4(1):1-8, 1975.

The functional and morphological aspects of the liver in idiopathic and secondary hemochromatosis (Hm) were investigated. Thirty-three Hm patients (13 idiopathic Hm, 13 Hm secondary to liver diseases, and 7 Hm due to iron overload) underwent a series of chemical and biological tests. The following analyses were performed: SGOT and SGPT, OCT, BSP retention, fractionated and total bilirubin, prothrombin time, serum proteins, and immunoglobulins. Each patient underwent a liver biopsy. In idiopathic Hm patients, the biological indices were usually normal. BSP retention was slightly altered in 31% of the cases; in 23% of the cases, bilirubin and SGPT levels were changed and the immunoglobulin level was raised. Light microscopy revealed small changes in the liver tissue. In all cases, intense siderosis was observed. Electron microscopy showed increased pigmentation in the hepatocytes. In Hm secondary to cirrhosis, the major changes were in BSP retention, Quick time, and in bilirubin, albumin and immunoglobulin levels. The liver was also altered structurally, showing increased pigmentation and alterations in the hepatocytes. In Hm secondary to an iron overload, there was a correlation with the degree of hepatic siderosis. In any case, the severity of the hepatic lesion was not influenced by the intensity of the siderosis.

8974 HYPERCHOLESTEROLAEMIA IN PRIMARY CANCER OF THE LIVER. *(E.)* Goldberg, R. B.; Bersohn, I.; Kew, M. C. (Johannesburg Hosp., Johannesburg, South Africa). *S. Afr. Med. J.* 49(36):1464-1466, 1975.

To determine the frequency with which hypercholesterolemia occurs in primary hepatocellular cancer (PHC), serum cholesterol levels were measured in 132 black South Africans with this tumor. Because of the association between hypercholesterolemia and obstructive jaundice, serum conjugated bilirubin and alkaline phosphatase levels were measured as indices of cholestasis, and the presence or absence of biliary obstruction was established at necropsy. Only 14 (10.6%) of the 132 patients with PHC had a raised serum cholesterol level and the serum conjugated bilirubin or alkaline phosphatase levels. Only two of 14 patients with biliary obstruction had hypercholesterolemia (277 and 326 mg/100 ml, resp.). In one of these patients, the effects of a cholesterol diet (3 g/day for 72 hr) on *in vitro* cholesterol synthesis in the tumor and on high serum cholesterol levels were studied. Both acetate and mevalonate were used as substrates in assessing cholesterol synthesis. Cholesterol feeding, which markedly suppressed hepatic synthesis in normal subjects, did not inhibit synthesis in the tumor. This result is in agreement with previous studies showing lack of a feedback regulation of hepatic cholesterol synthesis in experimental tumors and also in two other patients with PHC. It is suggested that this defect results from a decrease in the availability of exogenous cholesterol to the malignant hepatocyte, rather than an abnormality in β-hydroxy-β-methyl-glutaryl-coenzyme A reductase from hepatoma tissue.

8975 THE SIGNIFICANCE OF HYPONATRAEMIA IN LIVER FAILURE. *(E.)* Ring-Larsen, H. (Rigshospitalet, Univ. Hosp., Copenhagen, Denmark). *Postgrad. Med. J.* 51(598):542-543, 1975.

The use of peritoneal dialysis for the correction of serum sodium levels in patients with liver failure complicated by hyponatremia was evaluated. Seventeen patients, aged 12 to 69 yr, were studied; all had extremely low serum sodium, advanced liver failure due to acute liver disease or acute exacerbation in chronic liver illness. Their diseases were diagnosed as cryptogenic cirrhosis (5 patients), alcoholic cirrhosis (6), viral hepatitis (2), halothane hepatitis (2) and common duct stone (1). Five patients had hyperkalemia and two had hypokalemia; these conditions were corrected before the start of dialysis. Peritoneal dialysis was commenced when the serum sodium was below 125 mEq/l. The dialysing solution contained 140 mEq Na^+, 4 mEq K^+, 1.8 mEq Mg^{2+}, 45 mEq lactate and 1.5% glucose. Protein loss was measured and compensated for by i.v. human albumin administration. Serum sodium rose significantly from 119 mEq/l before dialysis to 130 mEq during dialysis. The serum ammonia in five patients changed from a mean value of 125 μM/l before dialysis to 75 μM/l after dialysis. The 24-hr urinary sodium was extremely low in all but one patient and did not rise following dialysis. Potassium concentrations decreased below the initial levels, and a significant rise in the mean standard bicarbonate was noted. Three patients survived for more than six months; eight died four to seventeen days after dialysis, and six died during the procedure. The survival time is correlated with diuresis, but not with the 24-hr sodium output, nor with the serum sodium concentration before dialysis. The poor prognosis in pronounced hyponatremia is confirmed by the 82% mortality rate.

8976 MONOMERIC IgM IN ACUTE AND CHRONIC LIVER DISEASE. *(Ger.)* Schwarz, J. A.; Kaboth, U.; Reikowski, H.; Jost, H.; Muting, D.; Ortmanns, H. (Med. Klinik Poliklinik, Universitat Saarlandes, D-6650 Homburg/Saar, Germany). *Klin. Wochenschr.* 53(11):535-538, 1975.

Using a modification of the technique of Strobo and Thomasi, monomeric IgM was determined by diffusion in a 5% polyacrylamide gel for 24 hr in sera from patients with acute viral hepatitis, chronic aggressive and chronic persistent hepatitis, cirrhosis, and fatty liver. During the first six wk after the onset of acute viral hepatitis, monomeric IgM was detected one or more times in sera from 56.3% of 80 patients. No relation was found between the time at which monomeric IgM appeared and increases in immunoglobulin fractions, the total immunoglobulin level, rheumatoid factor, and hepatitis B antigen (HBAg) or antibody (HBAb). The test for monomeric IgM was still positive after three months in six patients; two of these patients had histological evidence of chronic aggressive hepatitis when biopsied after one yr. Monomeric IgM was present in sera from 47.5% of 61 patients with chronic aggressive hepatitis and in only 15.4% of 26 patients with chronic persistent hepatitis; in 36.4% of 88 patients with cirrhosis; and in only 4.2% of 24 patients with fatty liver. No monomeric IgM was present in any of 16 clinically and histologically HBAg carriers. Among patients with chronic aggressive and chronic persistent hepatitis and those with cirrhosis, no relation was found between HBAg or between immunoglobulin fractions and the presence or absence of monomeric IgM. However, indirect immunofluorescence showed that the incidence of antinuclear and anti-smooth muscle antibodies was greater in sera that contained monomeric IgM from patients with chronic aggressive hepatitis and cirrhosis than in sera that did not. The reverse relation was true in acute viral hepatitis and chronic persistent hepatitis. No clearcut relation was observed between the incidence of rheumatoid factor and monomeric IgM. The number of patients in each group was too small to analyze statistically. This is believed to be the first report of the detection of monomeric IgM in patients with chronic hepatitis. It is suggested that this test might be useful in establishing a diagnosis and prognosis of chronic liver disease.

8977 KINKY HAIR DISEASE: STUDY OF COPPER METABOLISM WITH USE OF ^{67}Cu. *(E.)* Dekaban, A. S.; Aamodt, R.; Rumble, W. F., Johnston, G. S.; O'Reilly, S. (Natl. Inst. Neurol. Commun. Disord.

Stroke, Bethesda, Md.). *Arch. Neurol.* 32(10):672-675, 1975.

The metabolism of ^{67}Cu (3-50 μCi, i.v. or p.o.) was studied in 3 patients with kinky hair disease, 2 patients with hepatolenticular degeneration, and 1 unaffected control. Following administration of the copper, whole body counts were made with scintillation detectors and probe measurements were made with a dual probe instrument. The urine, stools, and blood were analyzed for activity and retention. The serum Cu and ceruloplasmin levels in all patients with kinky hair disease were 1/4 to 1/5 of normal values, while the urinary Cu levels were within the upper normal range. The daily total body counts after i.v. ^{67}Cu injection showed a high retention of Cu in kinky hair disease and hepatolenticular degeneration during the first 7 days; the elimination of Cu was much faster in the control. After p.o. ^{67}Cu administration, patients with kinky hair disease lost a substantial fraction of the administered activity within the first 3 days, while the other subjects retained relatively large percentages of the Cu. The measured absorption of labeled Cu in kinky hair disease was 11-13%, compared with a previously reported value of 56% in normal subjects and patients with hepatolenticular degeneration. In both groups of patients, the labeled Cu was retained at a very high level in the liver and very little entered the circulation during the first 8 days after administration. The incorporation of Cu into the red blood cells was low but satisfactory in kinky hair disease, but, in contrast to the control, plasma ^{67}Cu levels did not increase with time in either group of patients. The results indicate that the administration of a suitable Cu compound which could facilitate the absorption or transport of this metal would be a good starting point in the treatment of kinky hair disease. Compounds such as Cu-albumin, Cu-histidine-threonine, and Cu-threonine and Cu-glutamine complexes are suggested.

8978 PRIMARY HEPATIC LEIOMYOSARCOMA: A REPORT OF TWO CASES. *(E.)* Masur, H.; Sussman, E. B.; Molander, D. W. (Memorial Sloan Kettering Cancer Center, New York, N.Y.). *Gastroenterology* 69(4):994-997, 1975.

Two new cases of primary hepatic leiomyosarcoma are reported, and seven previously reported cases are discussed. A 62-yr-old Caucasian woman presented with progressive fatigue, right upper quadrant pain, abdominal distension, and an enlarged nodular liver four months antemortem. While undergoing diagnostic workup, the patient went into hepatic failure, then renal failure, developed sepsis, and died. At postmortem examination, the liver was 90% replaced by confluent, fleshy, gray-white tumor nodules with focal areas of hemorrhage, necrosis, and cystic degeneration. Microscopically, the tumor was a leiomyosarcoma of predominantly long spindle-shaped cells in interlacing fascicles. A 66-yr-old Caucasian woman presented right upper quadrant pain associated with anorexia and weight loss. Laparotomies revealed a large hepatic mass and subsequent replacement of the right liver lobe with gray-white tumor nodules. The patient died 37 months later; postmorten examination showed an enlarged left liver node and numerous tumor nodules microscopically defined as interlacing spindle-shaped leiomyosarcoma cells. A literature review noted little prior physical or laboratory evidence of the leiomyosarcoma, morbidity related primarily to massive replacement of hepatic parenchyma vs metastases, and the slow tumor growth. Hence, aggressive hepatic surgery was suggested to improve prognosis.

8979 NATRIURETIC HORMONE--ITS POSSIBLE ROLE IN FLUID AND ELECTROLYTE DISTURBANCES IN CHRONIC LIVER DISEASE. *(E.)* Kramer, H. J. (Medizinische Universitats-Poliklinik, 53 Bonn 1, Wilhemstrasse 35-37, West Germany). *Postgrad. Med. J.* 51(598):532-540, 1975.

The possibility that enhanced proximal tubular sodium resorption in chronic liver disease may depend on a natriuretic hormone was investigated. The effects of plasma and plasma fraction IV from seven patients with liver cirrhosis (6 also had ascites) on sodium transport in isolated frog skin and on renal sodium excretion in female Sprague-Dawley rats were compared with the antinatriferic and natriuretic effects of plasma from six healthy subjects. Natriuretic plasma obtained from healthy subjects after acute expansion of the extracellular fluid volume (ECV) significantly inhibited the potential difference (PD) of isolated frog skin by $-43.8 \pm 5.5\%$ and the short circuit current (SCC) by $-41.3 \pm 1.7\%$ when applied to the inner skin surface. Control plasma from these subjects and plasma from patients with cirrhosis and ascites inhibited PD by $-3.8 \pm 4.7\%$ and $-5.2 \pm 3.7\%$ and SCC by $-7.3 \pm 4.6\%$ and $-11.7 \pm 2.5\%$, resp. Similar effects on PD and SCC were observed with plasma fraction IV. Fraction IV from ECV-expanded healthy subjects caused marked diuresis and natriuresis when injected i.v. into rats, whereas fraction IV from cirrhotic patients failed to affect urinary flow rate, free-water clearance, or renal sodium excretion. These results suggest that at least some patients with cirrhosis and sodium retention may lack sufficient humoral natriuretic activity to promote renal sodium excretion.

8980 A NEW FORM OF PORPHYRIA: ERYTHROPOIETIC PORPHYRIN HEPATITIS. *(Fr.)* Aguade, J.; Herrero, C.; Almeida, J.; Mas, A. C.; Ferrando, J.; De Asprer, J.; Palou, A.; Gimenez, A. (Faculté de Médecine, Université de Barcelone, Spain). *Ann. Dermatol. Syphiligr. (Paris)* 102(2):129-136, 1975.

A case of porphyria in an 8-yr-old girl with symtomatology beginning in early infancy is described. A general physical examination, laboratory examinations, functional hepatic tests, investigation of porphyria and its precursors, as well as uni- and bi-dimensional chromatographies were performed. The clinical symtoms were as follows: extreme photosensitivity, atrophic scarring of exposed areas, mutilation of the distal extremities of the face and hands and a severe hypertrichosis. The mucous mem-

brances seemed intact and the teeth normal. No signs of hepato- or splenomegaly were obvious. The patient presented the characteristics of both cutaneous porphyrin hepatitis (PCT) and erythropoietic protoporphyria (PPE), but the excretion of urinary porphyrins showed a chromatographic "type" different from both PCT and PPE. Large amounts of 5-COOH carboxyl porphyrins were eliminated and high levels of protoporphyrins were registered in the erythrocytes as well as in the erythroblasts of bone marrow. The porphyrine excretion pattern of the stools was similar to that in PCT. A secondary protoporphyric hepatopathy could not be diagnosed. The onset of the sickness having taken place in early infancy suggested a possible genetic transmission of still unknown origin. The evaluation of the case is that a new form of porphyria has been encountered, one not yet reported.

8981 A CASE/CONTROL STUDY OF THE ASSOCIATION BETWEEN PRIMARY LIVER CANCER AND HEPATITIS B INFECTION IN SENEGAL. *(E.)* Prince, A. M.; Szmuness, W.; Michon, J.; Demaille, J.; Diebolt, G.; Linhard, J.; Quenum, C.; Sankale, M. (Lindsley F. Kimball Res. Inst., New York Blood Center, 310 East 67 St., New York, N.Y. 10021). *Int. J. Cancer* 16(3):376-383, 1975.

Radioimmunoassay and passive hemagglutination techniques were used to determine the prevalence of hepatitis B surface antigen (HBsAg) and antibody (anti-HBs) in 165 patients with primary liver cancer, in 153 age/sex-matched controls with cancer of other sites, and in 328 age/sex-matched hospitalized controls without cancer. HBsAg was detected in serum from 61.2% of the patients with liver cancer as compared with 11.7% of the controls with other cancers and with 11.3% of the noncancer controls. The frequency of HBsAg in male liver cancer patients was slightly higher than in females (63.0% versus 55.3%). In all groups, a decline in HBsAg prevalence was seen in those older than 50 yr. The prevalence of anti-HBs was lowest in patients with liver cancer; the combined prevalence of HBsAg and anti-HBs in this group was 79.4% as opposed to 57.1% in the controls with other cancers and 53.4% in the noncancer controls. Within the primary liver cancer group, the frequency of HBsAg was significantly higher in patients with α-fetoprotein (72.3%) than in those without α-fetoprotein (40.3%). Liver cancer patients with and without accompanying cirrhosis did not differ in the frequency of HBsAg. No significant difference in history of potential hepatitis exposure was found in the three study groups. These results unequivocally confirm previous studies indicating a specific association between the frequency of HBs antigenemia and primary liver cancer. The possibility that this association may be an expression of an intrinsic oncogenic potential of hepatitis B virus is discussed.

8982 LIVER BIOPSY IN METHOTREXATE-TREATED PSORIATICS—A RE-EVALUATION. *(E.)* Zachariae, H.; Grunnet, E.; Sogaard, H. (Marselisborg Hosp., Univ. Aarhus, Aarhus, Denmark). *Acta Derm. Venereol.* 55(4):291-296, 1975.

Liver biopsies (286) were performed on 139 psoriatics either on treatment or being considered for treatment with methotrexate. Both pre- and post-methotrexate biopsies were performed in 56 cases; the average methotrexate dose was 9.36 mg. No significant differences were noted between pre- and post-methotrexate biopsy specimens, except for slight increase in fatty infiltration found when all pre-methotrexate biopsies were compared with the total number of latest post-methotrexate samples. Alcohol was significantly associated with liver fibrosis in pre-methotrexate biopsies. An increase in liver pathology was noted in patients treated with potassium arsenite and methotrexate. Only 1 of 22 (5%) psoriatics with a total normal biopsy had been on arsenite, but 6 of 18 (33%) of the same group of psoriatics who had fibrosis had been on this drug at an earlier time. In three cases, liver cirrhosis appeared in a biopsy from a methotrexate-treated psoriatic who had no signs of fibrosis or cirrhosis in a pre-methotrexate biopsy. However, this incidence was low in relation to the number of patients treated. It is suggested that this low incidence of cirrhosis results from use of an intermittent dose schedule. The possibility of cirrhosis necessitates performance of liver biopsies in the control of psoriatics on long-term methotrexate therapy. It is concluded that the severity of the disease may be a complicating factor in the pathogenesis of liver damage.

8983 A PROSPECTIVE STUDY OF THE EFFECTS OF WEEKLY ORAL METHOTREXATE ON LIVER BIOPSY. FINDINGS IN SEVERE PSORIASIS. (E.) Warin, A. P.; Landells, J. W.; Levene, G. M.; Baker, H. (London Hosp., London, England). *Br. J. Dermatol.* 93(3):321-327, 1975.

Methotrexate (MTX) toxicity was studied in 2.5 (aged 23-78 yr) patients with severe psoriasis. Liver biopsies were taken before and at intervals after the onset of MTX treatment (intermittent dosage schedule). Most patients received only a single weekly dose. Five patients had some of their treatment in divided doses over 24 hr each week and two patients had all their MTX by this regimen. No tendency toward hepatopathy was found. Four patients exhibited a mild inflammatory cell infiltrate and a mild fibrosis was seen in two patients before treatment. During treatment only one developed a grade 2 infiltrate and one other, a grade 2 fibrosis; none developed cirrhosis. Fluctuations in the degree of inflammation and fibrosis were observed. It is suggested that some of the hepatotoxicity reported previously may be attributable to the daily dose schedule and the failure to detect patients with abnormal liver histology before treatment.

8984 RENAL TUBULAR ACIDOSIS IN CHRONIC LIVER DISEASE. *(E.)* Golding, P. L. (Royal Portsmouth Hosp., Portsmouth, Hants, England). *Postgrad. Med. J.* 51(598):550-556, 1975.

An extension of a previous systematic study determining the prevalence and nature of distal tubular acidification defects in patients (117) with chronic

liver disease is reported. Overt renal tubular acidosis was diagnosed in those patients who had a metabolic acidosis and whose urine pH was 6 or greater. Incomplete acidosis was detected *via* ammonium chloride and calcium chloride acid loading tests. The highest incidence of incomplete and overt renal tubular acidosis was found in patients with primary biliary cirrhosis and/or active chronic hepatitis; in all, 32% (38 patients) had a tubular defect. Patients with overt acidosis presented with symptoms of polydypsia, polyuria, muscular weakness, nausea and vomiting. Hypokalemia occurred in 7 of 11 patients with overt acidosis and osteomalacia was seen in two patients. Proteinuria occurred in ten patients with either the incomplete or overt forms and nephrocalcinosis was observed in two patients. There were no correlations between the globulin level or serum copper and the absence, presence, or type of acidosis. Qualitative changes in the pattern of acid excretion were noted in many patients with acidifying defects, while no substantial abnormalities in creatinine clearance were observed. The presence of renal tubular acidosis could not be significantly associated with abnormal levels of IgA, IgG, IgM, or with any particular autoantibody. Renal histology revealed interstitial nephritis, diffuse calcinosis, and minimal glomerular changes. However, in two patients, immunofluorescent techniques showed linear staining of the basement membrane due to antibody deposition. The possibility that cell-mediated immune mechanisms might be responsible for the tissue damage and the tubular defect was tested using the leukocyte migration inhibition test. Abnormalities of WBC migration were confined to patients with renal tubular acidosis in the active chronic, primary biliary cirrhosis, and cryptogenic cirrhotic groups. Although the association between renal tubular acidosis and chronic liver disease could be due to multiple factors, immunological mechanisms probably play a major role. The data suggest that electrolyte abnormalities are a result of, rather than the cause of, the renal tubular acidosis.

8985 THE ROLE OF RENIN IN RENAL FAILURE ASSOCIATED WITH HEPATIC FAILURE. *(E.)* Smith, I. K. (King's Coll. Hosp. Medical Sch., Denmark Hill, London S.E.5, England). *Postgrad. Med. J.* 51(598): 506-508, 1975.

A literature review of the role of renin in hepatic failure and in the pathology of renal failure associated with liver disease is presented. Studies employing the development of glycerol-induced renal failure suggest a role of renin in the pathogenesis of circulatory renal failure by the generation of angiotensin I and its subsequent conversion to angiotensin II. Little is known of the intrarenal action of renin; however, no correlation of the progress of renal failure with changes in the renin-angiotensin system has been noted. An increased renal plasma flow resulting from infusions of dopamine in one experiment reversed the elevated plasma renin activity found in association with liver disease, suggesting that plasma renin activity is determined (at least in part) by the renal blood flow. Isolated perfused kidney experiments suggest that renin-substrate depletion is capable of influencing a reduction in intrarenal angiotensin generation. However, it is noted that elevated renin levels in peripheral plasma are equally likely a cause or consequence of reduced renal perfusion. In preliminary studies on the role of the renin-angiotensin system in hepatic and renal failure associated with acute tubular necrosis, no consistent pattern emerged. Venous plasma renin concentration was markedly elevated in all patients studied, yet renal renin secretion was documented only once.

8986 CONSEQUENCES OF ACUTE RENAL FAILURE RELEVANT TO HEPATIC FAILURE. *(E.)* Weston, M. J.; Wilkinson, S. P. (King's Coll. Hosp. and Medical Sch., Denmark Hill, London S.E.5, England). *Postgrad. Med. J.* 51(598):486-488, 1975.

The consequences of renal failure in patients with liver disease are discussed. High blood ammonia levels, amino acid accumulation (resulting in an overspill aminoaciduria), and a rise in plasma octopamine occurred in these patients. Administration of fresh frozen plasma can lead to circulatory overload and pulmonary edema. Factors involved in hemorrhage associated with liver failure include a synthetic defect of coagulation factors, disseminated intravascular coagulation, esophageal varices, and mucosal hemorrhages induced by endotoxins. Infection is an important cause of death in patients with acute renal failure; the causes of infection involve impaired cell-mediated immunity, phagocytic activity, and reticulo-endothelial function. Therapeutic considerations in the management of renal failure are evaluated; these include the use of diuretics, oral neomycin and gentamicin. Hemodialysis with a cuprophane membrane or peritoneal dialysis can efficiently remove ammonia, correct hyponatremia and alkalosis, and correct the uremic syndrome. However, no long-term survivals have been found in cirrhotic patients.

8987 THE QUANTITATIVE DETERMINATION AND PHENOTYPING OF CERULOPLASMIN IN WILSON'S DISEASE. *(Ger.)* Goedde, H. W.; Benkmann, H. G.; Lange, J.; Harders, H. (Institut Humangenetik, Universitat D-2000 Hamburg 54, Butenfield 32, Germany). *Klin. Wochenschr.* 53(15):731-734, 1975.

Horizontal starch gel electrophoresis was used for determining the ceruloplasmin phenotypes of 17 patients (9 males and 8 females) with Wilson's disease and those of 48 of their relatives. Radial immunodiffusion was employed for quantitative determinations of ceruloplasmin and transferrin, and simultaneous determinations were made of the phenotype for the C3 component of complement and for pseudocholinesterase. Controls consisted of 727 normal subjects. The Cp BB phenotype of ceruloplasmin was found in all 17 patients, their 48 relatives, and the 727 controls. Only the UU phenotype for cholinesterase was found; the most common transferrin phenotype was the common CC; and the frequencies for C3 were within normal limits for Central Europeans. No differences in phenotypes were

found between patients with Wilson's disease and controls. Quantitative determinations of ceruloplasmin confirmed that there was considerable overlapping between subjects assumed to be heterozygotes and normal controls. With one exception, all patients with Wilson's disease had ceruloplasmin concentrations of 0 to 10 mg/100 ml serum. These concentrations ranged from 12 to 47 mg/100 ml in heterozygotes and from 20 to 62 mg/100 ml in controls. These findings provide no support for the hypothesis that the primary defect in Wilson's disease is a structural and functional abnormality in ceruloplasmin.

8988 FAMILIAL WILSON'S DISEASE: COPPER-INDUCED HEMOLYSIS, HYPERSPLENISM SYNDROME, AND HYPERPIGMENTATION AS THE PRINCIPAL SYMPTOMS. *(Ger.)* Steiner, P.; Frey, P.; Lupi, G. A.; Kistler, H. J. (Spital Limittal, CH-8952 Schlieren, Switzerland). *Schweiz. Med. Wochenschr.* 105(27):872-879, 1975.

A 17-yr-old boy was hospitalized with splenomegaly, hyperpigmentation on both lower legs, Kayser-Fleischer rings, and neurological symptoms (tremor, absence of tendon reflexes, slurred speech, and mental retardation). With the exception of slightly increased BSP retention and a significant decrease in serum cholinesterase, liver function tests were initially normal, but laparoscopy showed nodular cirrhosis and moderate signs of portal hypertension. Cirrhosis was not evident in a liver biopsy, but a strongly positive reaction for Cu was obtained and urinary Cu excretion was decreased (212-278 µg/24 hr); ceruloplasmin was not present in the serum. Administration of increasing doses of D-penicillamine to a maximum of 1 g/day, with a low-Cu diet, increased urinary Cu excretion to 2000-3000 µg/24 hr and the corneal rings became paler. However, WBC and platelet counts continued to decrease, the patient's mental state failed to improve, and he had to be hospitalized for drug addiction. After splenectomy, the WBC and platelet counts normalized and the patient's mental condition stabilized. At the last followup, laparoscopy showed nodular cirrhosis with no evidence of portal hypertension, but liver function had deteriorated. The 12-yr-old sister of this patient was hospitalized when she developed jaundice. She had a history of postprandial abdominal pain which was sometimes accompanied by vomiting of bile. She had no psychiatric or neurological symptoms, but her liver was palpable 4 cm below the rib cage and she had Kayser-Fleischer rings. Liver function tests were abnormal, and urinary Cu excretion was decreased to 157 µg/100 ml. Cirrhosis and portal hypertension were diagnosed at laparoscopy. Immediately after institution of D-penicillamine and a low-Cu diet, the patient developed a fever and, after seven days, a hemolytic crisis which appeared to be caused by Wilson's disease rather than the drug. D-penicillamine was later resumed, and the patient has developed no serious complications in 3.5 yr. On the basis of increased urinary Cu excretion after D-penicillamine loading, the 15-yr-old sister of these patients is considered to have presymptomatic Wilson's disease. The parents are asymptomatic. The only abnormalities noted were slight decreases in serum ceruloplasmin and Cu levels in the mother.

8989 WILSON'S DISEASE (HEPATOLENTICULAR DEGENERATION) OF LATE ADULT ONSET: REPORT OF CASE. *(E.)* Fitzgerald, M. A.; Gross, J. B.; Goldstein, N. P.; Wahner, H. W.; McCall, J. T. (Mayo Graduate Sch. Medicine, Univ. Minnesota, Rochester, Minn.). *Mayo Clin. Proc.* 50(8):438-442, 1975.

A case of Wilson's disease, in which the onset of symptoms occurred in a male Caucasian at 55 yr of age, is reported. The patient initially complained of malaise and abdominal pain, and experienced persistent anemia. A limited family history of hepatic and neurologic disease was noted, and abdominal examination revealed only a palpable spleen tip. Routine urinalysis, hemoglobin, leukocyte count, platelet count, serum alkaline phosphatase level, serum albumin, and globulin tests all gave values within the normal range. Esophageal varices were demonstrated roentgenologically and a liver scan with Tc-Sc colloid showed small organ size and increased uptake by the reticuloendothelial system of the spleen and vertebrae. Radiocopper studies using carrier-free ^{67}Cu were typical of a homozygous state in Wilson's disease; no incorporation of ^{67}Cu into serum ceruloplasmin, increased urinary excretion of ^{67}Cu, and increased total body retention of the isotope were noted. Despite a therapeutic program of oral D-penicillamine (250 mg, four times daily), a low-copper diet, and vitamin K_5 (4 mg daily), death resulted from hemorrhage from the esophageal varices. At autopsy, the liver copper concentration was 892 µg/g of dry weight, and the renal copper concentration was 81 µg/g. The combination of Kayser-Fleischer rings, low concentration of serum ceruloplasmin, elevated urinary excretion of copper, and marked cupriuresis after D-penicillamine administration supported the diagnosis of Wilson's disease. The late clinical onset and presenting hepatic dysfunction were noted as especially unusual. The necessity of considering Wilson's disease in the differential diagnosis of patients with chronic hepatitis or with cirrhosis of undetermined etiology is emphasized. Suggested screening procedures include determination of serum ceruloplasmin, 24-hr urinary copper excretion, slit-lamp biomicroscopy of the corneas for Kayser-Fleischer rings, liver biopsy, hepatic copper concentration, and a study of copper kinetics.

8990 A CONTROLLED TRIAL OF REPEATED HALOTHANE ANAESTHETICS IN PATIENTS WITH CARCINOMA OF THE UTERINE CERVIX TREATED WITH RADIUM [abstract]. *(E.)* Trowell, J.; Smith, A. C. (Dept. Med., Univ. Oxford, England). *Gut* 16(5):403, 1975.

8991 A CONTROLLED PROSPECTIVE TRIAL OF THE EFFECT OF MULTIPLE EXPOSURES TO HALOTHANE ON LIVER FUNCTION [abstract]. *(E.)* Wright, R.; Crampton Smith, A.; Trowell, J.; Chisholm, M.; Hawksley, M.; Eade, O. E.; Lloyd, B.; Edwards, J. C.; Moles, T. M. (Southampton Univ. Hosp., England). *Gut* 16(5):403, 1975.

8992 DEFECTIVE PLATELET FUNCTION WITH DEFICIENCY OF 'STICKY PLATELETS' IN FULMINANT HEPATIC FAILURE [abstract]. *(E.)* Weston, M. J.; Langley, P. G.; Williams, R. (King's Coll. Hosp., London, England). *Gut* 16(5):402, 1975.

8993 QUANTITATIVE ASSESSMENT OF LIVER FUNCTION AND PROGNOSIS USING ^{131}I ROSE BENGAL [abstract]. *(E.)* Triger, D. R.; Gamlen, T. R.; Ackery, D. M.; Fleming, J. S.; Grant, R. W.; Kenny, R. W.; Maciver, A. G.; Wright, R. (Southampton Univ. Hosp., Southampton, England). *Gut* 16(5):400, 1975.

8994 GLUCOGEN AND ATP-CONTENT OF THE LIVER AND THE INFLUENCE OF FRUCTOSE DURING ABDOMINAL OPERATIONS. *(E.)* Stremmel, W.; Koehnlein, H. E.; Neuburger, N. (Dept. Surgery, Univ. Freiburg, Freiburg, Germany). *Bull. Soc. Int. Chir.* 33(5-6):513-518, 1974.

8995 HEPATIC RESECTION. *(E.)* Ong, G. B.; Lee, N. W. (Dept. Surgery, Univ. Hong Kong, Hong Kong). *Br. J. Surg.* 62(6):421-430, 1975.

8996 DEATH FROM HEPATIC FAILURE AFTER JEJUNOILEAL ANASTOMOSIS. *(E.)* Spin, F. P.; Weismann, R. E. (Dept. Surgery, Hitchcock Clinic, Hanover, N.H.). *Am. J. Surg.* 130:88-91, 1975.

8997 THE CONTRIBUTION OF LIVER BIOPSIES TO CLINICAL DIAGNOSIS. *(Nor.)* Nesje, O. A.; Arva, P.; Normann, T. (Baerum Sykehus, Norway). *Tidsskr. Nor. Laegeforen.* 95(6):362-364, 1975.

8998 HEMANGIOMA OF THE LIVER. DIAGNOSIS WITH COMBINED USE OF LAPAROSCOPY AND HEPATIC ARTERIOGRAPHY. *(E.)* Kato, M.; Sugawara, I.; Okada, A.; Kuwata, K.; Satani, M.; Okamoto, E.; Manabe, H. (Osaka Univ. Medical Sch., Osaka City, Osaka, Japan). *Am. J. Surg.* 129(6):698-704, 1975.

8999 LIVER DISEASES ASSOCIATED WITH GASTRIC DISEASE. *(Ger.)* Kleine, F. D.; Liebmann, S.; Friebel, H. (Medizinische Adademie, DDR-201 Magdeburg, Leipziger Str. 44, Germany). *Dtsch. Z. Verdau Stoffwechselkr.* 34(5/6):287-291, 1974.

9000 MULTINUCLIDE EVALUATION OF HEPATIC MASS LESIONS. *(E.)* Koenigsberg, M.; Freeman, L. M. (Albert Einstein Coll. Medicine, Bronx, N. Y.). *CRC Crit. Rev. Clin. Radiol. Nucl. Med.* 6(2):113-152, 1975.

9001 ULTRASTRUCTURE OF LIVER-BIOPSY TISSUES FROM REYE'S SYNDROME. *(E.)* Watanabe, W.; Ohkawa, K.; Kobayashi, O. (Niigata Univ. Sch. Medicine, Niigata, Japan). *Nihon Rynsho Denshi Kenbikyo Gakkai-Shi* 7(3-4): 359, 1975.

9002 THE CARBON-TETRACHLORIDE-HEPATOTOXICITY AS A MODEL OF LIVER DAMAGE. FIRST REPORT: LONGTIME BIOCHEMICAL CHANGES. *(E.)* Paquet, K. J.; Kamphausen, U. (Dept. Surgery, Univ. Bonn, Bonn, Germany). *Acta Hepatogastroenterol.* 22(2):84-88, 1975.

9003 DIAGNOSIS OF LIVER LESIONS IN AMYLOIDOSIS. *(Rus.)* Podymova, S. D.; Zolotarevsky, V. B.; Nasonov, E. L. (Dept. of Therapy and Pathological Anatomy, I. M. Sechenov First Moscow Medical Institute, USSR). *Ter. Arkh.* 47(2):67-71, 1975.

9004 HEPATIC REACTION IN ULCERATIVE COLITIS AND CROHN'S DISEASE. *(Ger.)* Morl, M. (Medizinische Universitatsklinik mit Poliklinik, 852 Erlangen, Krankenhausstrasse 12, Germany). *Med. Klin.* 70(15): 670-673, 1975.

9005 CONSIDERATIONS ON A CASE OF MICROANGIOMATOSIS OF THE LIVER. *(It.)* Galluzzo, A.; Lo Guzzo, R.; Gassi, Jr., G. B.; Amarisse, C. (Ospedale Riuniti, Roma, Italy). *Chir. Gastroenterol.* 8(4):468-473, 1974.

9006 GRANULOCYTE ALKALINE PHOSPHATASE ACTIVITY IN PATIENTS TREATED WITH X-RAYS FOR BREAST CARCINOMA. *(Pol.)* Sochacka-Kuzko, B.; Urasinski, I.; Meyer, A. (Clinic of Hematology, Polish Acad. of Medical Sciences, Szczecin, Poland). *Pol. Tyg. Lek.* 30 (8):349-352, 1975.

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9051 ACUTE EFFECT OF ORAL ETHANOL ON BROMSULPHALEIN (BSP) TRANSPORT RATES IN HEALTHY HUMANS WITH DIFFERENT DRINKING HABITS [abstract]. *(E.)* Safavi, S. S.; Raichlen, J. S.; Weiss, J. B.; Long, W. B.; Marin, G. A. (Dept. Med., Univ. Pennsylvania, Philadelphia, Pa.). *Clin. Res.* 23(3):255A, 1975.

9052 GENERALIZED CALCIFICATION OF THE LIVER IN ADVANCED SCHISTOSOMIASIS JAPONICA--A CASE REPORT. *(E.)* Okuda, K.; Jinnouchi, S.; Arakawa, M.; Nitta, A.; Nakashima, T. (Univ. Sch. Medicine, Chiba, Japan). *Acta Hepatogastroenterol.* 22(2):98-102, 1975.

9053 REYE'S SYNDROME. REPORT OF CASES AND A REVIEW OF LITERATURE. *(E.)* Simmons, R. E.; Reddy, J. K. (Dept. Pediatrics, KUMC, Kansas City, Kansas 66103). *J. Kans. Med. Soc.* 76(6):119-124, 1975.

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9057 HEPATIC ULTRASTRUCTURAL CHANGES IN VINYLCHLORIDE (VC) WORKERS [abstract]. *(E.)* Triche, T.; Nanba, K.; Ishak, K.; Wolkoff, A.; Berk, P. D. (Natl. Inst. Health, Bethesda, Md.). *Clin. Res.* 23(3):259A, 1975.

9058 PRIMARY LIVER CANCER WITH AND WITHOUT CIRRHOSIS. A REVIEW OF 50 CASES. *(Sp.)* Hernandez-Guio, C.; Morono, E.; Ojeda, C.; Sarasa, J. L. (Fundacion "Jimenez Diaz," Univ. Autonoma, Madrid, Spain). *Rev. Clin. Esp.* 135(5):455-462, 1975.

9059 SHORT CHAIN FATTY ACIDS (SCFA) IN REYE'S SYNDROME (RS) [abstract]. *(E.)* Varma, R. R.; Cheravil, G.; Casper, J. T.; Lewis, J. D.; Harrington, G.; Parker, H. W. (Med. Coll. of Wisconsin, Milwaukee, Wis.). *Gastroenterology* 68(4): 1086, 1975.

See also, 8227, 8232, 8425, 8426, 8438, 8439, 8440, 8446, 8447, 8448, 8449, 8454, 8456, 8458, 8466, 8467, 8471, 8473, 8524, 8531, 8565, 8576, 8670, 9078, 9108, 9118, 9162, 9166, 9167. 9189, 9206, 9219, 9234, 9291, 9305, 9313, 9319, 9386.

LIVER AND BILIARY TRACT

Hyperbilirubinemic States

9060 HYPERBILIRUBINAEMIA AND BACTERIAL INFECTION IN THE NEWBORN: A PROSPECTIVE STUDY. *(E.)* Anonymous. (No affiliation given). *Arch. Dis. Child.* 50(8):652-653, 1975.

The incidence of bacterial infection associated with unexplained hyperbilirubinemia was determined prospectively in 69 preterm and term infants under two wk of age. Hyperbilirubinemia was defined as being characterized by a serum bilirubin level above 5 mg/dl on day 1, 10 mg/dl on day 2, or 12 mg/dl on any day thereafter. Criteria for infection were any bacterial isolate from blood, suprapubic aspirated urine, CSF (cultured from 22 infants), or 10^5 organisms/mm^3 from a clean-voided urine specimen. Gram-negative bacterial infection was detected in only 3% of the infants (2 of 69); neither patient had direct bilirubin greater than 0.4 mg/dl. The results indicate that urinary tract infections in the first week of life can be associated with jaundice, but the data are insufficient to document a cause-effect relation.

9061 THE DUBIN JOHNSON SYNDROME. *(E.)* Singh, D. S.; Sama, S. K.; Lal, K. (All-India Inst. Medical Sciences, Ansari Nagar, New Delhi-16, India). *J. Assoc. Physicians India* 23(4):277-281, 1975.

Nine cases of Dubin Johnson syndrome are described. The primary clinical signs were chronic, benign, persistent, or recurrent jaundice associated with upper abdominal ache, fatigue, and mild to moderate hepatomegaly. Icterus was noted as being due to intercurrent illness or stress. Values for hemogram, platelet count, and reticulocyte count, as well as bleeding, clotting, and prothrombin times, were generally normal. However, liver function tests showed total serum bilirubin values of 1.8 to 6.8 mg%, conjuagted bilirubin values of 1.2 to 3.4 mg%, total serum protein values of 6.4 to 7.9 g%, serum albumin values of 3.4 to 4.4 mg%, alkaline phosphatase values of 6.0 to 34 K.A.U., and SGOT/SGPT values of 0.77 to 2.16 μM-U-hr. Biliary passages and the gallbladder were frequently not visualized on peroral and i.v. cholangiograms; liver biopsies were consistently necessary for the diagnosis of Dubin Johnson syndrome. Dubin Johnson syndrome is frequently unrecognized in northern India.

9062 LIPOPROTEIN X (LP-X) IN PROLONGED JAUNDICE IN PREMATURE INFANTS. *(It.)* Vierucci, A.; Monterisi, N.; Petriccioli, G.; Bougleux, T.; Andreini, C. (Clinica Pediatrica, Universita Firenze, Italy). *Riv. Clin. Pediatr.* 86(2/3):85-88, 1973.

Lipoprotein-X (LP-X), leucine aminopeptidase (LAP), γ-glutamyl transaminase (γ-GT), alkaline phosphatase, SGOT, SGPT, lipoproteins, total cholesterol, and triglycerides were determined in blood from 34 premature infants with jaundice of longer than four days duration and total bilirubin concentrations of more than 10 mg/100 ml. Group one consisted of seven infants with direct bilirubin concentrations of more than 1 mg/100 ml, while group two consisted of 27 in whom serum bilirubin was present only in indirect form. While no positive tests for LP-X were obtained on sera from infants in group two, positive tests for LP-X were found in four of the seven infants in group one. These findings contrast with those obtained in adults with cholestasis, all of whom have positive tests for LP-X. The absence of LP-X in some of these infants may be due to a deficiency of apolipoprotein C in premature infants or to an impairment of some physiochemical mechanisms involved in the aggregation of plasma proteins and lipids which constitute the antigenic complex known as LP-X. The activities of enzymes implicated in cholestasis (LAP, γ-GT, and alkaline phosphatase) were increased in these infants, but SGOT and SGPT activities were unchanged. Although serum cholesterol levels were increased in only one of tne seven infants in group one, serum triglyceride levels were above the upper normal limit of 130 mg/100 ml in five of the seven. Immunoelectrophoresis showed an abnormal increase in lipoprotein in the β region, and precipitation lines for α-lipoproteins appeared irregularly. These findings suggest that the synthesis of peptides constituting apolipoprotein A is impaired in cholestasis and that peptide synthesis probably occurs asynchronously with changes in the assembly mechanism.

9063 FREE FATTY ACIDS AND UNCONJUGATED HYPERBILIRUBINAEMIA [abstract]. *(E.)* Cowan, R. E.; Kaye, J.; Thompson, R. P. H. (St. Thomas' Hosp., London, England). *Gut* 16(5):399, 1975.

9064 BSP METABOLISM AND TRANSPORT IN ROTOR'S SYNDROME [abstract]. *(E.)* Wolpert, E.; Wolkoff, A. W.; Pascasio, F.; Arias, I. M. (Nat. Institute of Nutr., Mexico City, Mexico). *Gastroenterology* 68(4):1067, 1975.

LIVER AND BILIARY TRACT

Nonviral Hepatitis and Hepatic Injury

9065 DIAGNOSIS OF DRUG-INDUCED ALLERGIC HEPATIC DISORDERS. *(E.)* Monna, T.; Enomoto, T.; Mizoguchi, Y. (Osaka City Univ. Medical Sch., Osaka, Japan). *Asian Med. J.* 18(3):29-32, 1975.

The incidence and diagnosis of drug-induced allergic liver disorders are discussed. The symptoms of such disorders include: fever, eruption, eosinophilia, and itching followed by jaundice, as well as a pattern of intrahepatic cholestasis. A certain drug may produce hepatic disorders in only a small number of people, and the severity and appearance of symptoms are variable and unrelated to drug dosage. Between 1945 and 1972, 2637 cases of drug-induced hepatic disorders were reported in Japanese medical journals: 554 cases were due to antituberculosis drugs, 428 were due to psychotropic agents, 357 were related to antibiotics, 314 were related to drugs acting on the circulatory system, 228 were food-related, 111 were caused by thorium dioxide,

106 were due to anabolic steroid hormone administration, 90 were caused by antipyretic, analgetic and anti-inflammatory agents, and 86 were caused by anti-neoplastic preparations. The number of cases increased yearly, as did the variety of drugs involved. The diagnosis of a drug-induced allergic hepatic disorder involves the use of an *in vitro* test in which sensitized patient lymphocytes come into contact with the drug, producing a chemical mediator such as a macrophage migration inhibitory factor. From a morphological standpoint, a blastoid transformation in the lymphocytes is also noted. Because these tests generally require a large quantity of blood, changing the concentration of the suspected drug and the use of microvolumes of peripheral blood for repeated examinations represent improvements. Histological findings in the liver are classified as cholestatic, cytotoxic, and mixed type. The histological findings are not consistent for a particular drug. This problem deserves the attention of clinicians in that the majority of drug-induced allergic hepatic disorders are produced by medical products.

9066 THE ISOENZYME PATTERN OF LACTATE DEHYDROGENASE FOLLOWING CHOLECYSTECTOMY PERFORMED WITH HALOTHANE ANESTHESIA. *(Ger.)* Klar, H.; Lundstrom, J.; Mollerberg, H.; Persson, G.; Ygge, H. (Regional Hosp., Skelleftea, Sweden). *Anaesthesist* 23(10):417-420, 1974.

Total serum LDH and serum LDH isoenzyme activities were determined for 51 patients who underwent uncomplicated cholecystectomy. Determinations were made on blood samples taken before surgery, immediately after discontinuation of anesthesia, and the first day after surgery. None of these patients had biliary inflammation or choledocholithiasis. The main anesthetic administered was halothane in 15 cases; methoxyflurane in 17; and other general anesthetics, (e.g., a thiopental/meperidine combination) in 19. Although LDH_5 activity was somewhat higher ($p > 0.05$) before surgery in the group of patients receiving halothane, no differences in total serum LDH activity were found among these three groups of patients. However, one day after surgery, total serum LDH activities were increased in patients receiving other general anesthetics ($p > 0.01$) and those receiving halothane ($p < 0.05$). Immediately after surgery, the activities of LDH_1-LDH_3 were decreased in all three groups but normalized on the day after surgery. Immediately after surgery, the LDH_4 activity was increased in all three groups; the next day the activity of this fraction had increased still further in patients given halothane and those receiving other general anesthetics ($p < 0.001$), while normal values were found in patients given methoxyflurane. Immediately after cholecystectomy, LDH_5 activities were significantly increased ($p < 0.001$) in all three groups of patients. This increase was about three times greater in patients given halothane than in the other two groups ($p < 0.005$). The day after surgery, the activity of the LDH_5 fraction was still about 25% higher in the halothane group than in the other two groups. These findings tend to confirm the theory that increases in the LDH_5 activity can be interpreted as a manifestation of liver injury initiated by halothane.

9067 ANICTERIC LIVER DAMAGE DURING NITROFURANTOIN MEDICATION. *(E.)* Klemola, H.; Penttila, O.; Runeberg, L.; Tallqvist, G. (Maria Hosp., SF-00180 Helsinki 18, Finland). *Scand. J. Gastroenterol.* 10(5):501-505, 1975.

Four women are described (aged 60-85 yr) in whom anicteric hepatitis appeared to be related to prolonged nitrofurantoin therapy (100 mg/day for 14 wk to 18 months). All four patients had increased serum transaminase levels, hypergammaglobulinemia, and liver biopsies suggestive of chronic active hepatitis. Features considered typical for this disorder were: infiltration of portal tracts by mononuclear cells and, to a lesser extent, by eosinophilic polymorphonuclear cells; piecemeal necrosis; and irregularity of the lobular margins with swollen liver cells surrounded by inflammatory cells. Three biopsies also showed cirrhotic features including penetration of lobuli by fibrous septa. Immunoelectrophoresis of serum proteins revealed the presence of an albumin-immunoglobulin G complex in two patients. The serum transaminases returned to normal within weeks after withdrawal of the drug, but the hypergammaglobulinemia and the liver biopsy findings persisted essentially unchanged during two to six months of observation. One patient was rechallenged with nitrofurantoin, which resulted in recurrence of elevated serum transaminases after nine wk of medication. These results indicate that long-term administration of nitrofurantoin in moderate doses may cause or trigger chronic hepatitis in susceptible persons with normal kidney function.

9068 ACUTE LIVER DISEASE AFTER CUTANEOUS THERMAL INJURY. *(E.)* Czaja, A. J.; Rizzo, T. A.; Smith, W. R., Jr.; Pruitt, B. A., Jr. (U.S. Army Inst. Surgical Res., Brooks Army Medical Center, Fort Sam Houston, Texas). *J. Trauma* 15(10):887-894, 1975.

Acute liver disease after cutaneous thermal injury was investigated in 81 (63 men and 18 women, average age 33.9 yr) patients, burned one week or less before admission, over an eight month period. SGOT, SGPT, alkaline phosphatase, lactic dehydrogenase, total and conjugated bilirubin, albumin, and total serum protein levels were determined by the multichannel auto-analyzer. The diagnosis of liver disease was made clinically only in patients who had either elevated SGOT and SGTP levels, or who had hepatomegaly and abnormal elevations of all serum enzymes. Patients with liver disease had a larger mean burn size and greater mortality than patients with normal liver studies. Burn size ranged from four to 96% of the body surface. Mortality within the study population reached 47%. Clinical and laboratory evidence of acute liver injury was present in 58% of the patients; the mean age of this group was 32.7 yr, the mean burn size was 57.9%, and the mortality rate was 74.5%. Four patterns of serum abnormality

were found: 1) abnormal transaminase elevation (ATE) without hyperbilirubinemia (22 patients), 2) ATE with early hyperbilirubinemia (6 patients), 3) ATE with early jaundice (8 patients), and 4) late onset of conjugated hyperbilirubinemia and jaundice (11 patients). Enzyme patterns revealing acute hemolysis and hepatocellular injury characterized the early postburn period. The magnitude of initial enzyme derangement did not distinguish the survivors, but jaundice was associated with poor prognosis (90% of the jaundiced patients died). The early occurence of hepatocellular injury suggests that acute hemodynamic alterations are important etiologically. Intrahepatic cholestasis and jaundice developed later in septic or hypoxic patients. Infusion of ATP and of human growth hormone support the metabolic needs of the burned patient and may minimize hepatocellular injury and accelerate recovery.

9069 HEPATOCELLULAR DAMAGE IN SCARLET FEVER. *(Pol.)* Granicki, O.; Kempa, E.; Szaflik, H. (Silesian Acad. Medicine, ul. Roosevelta 49, Bytomiu, Poland). *Pediatr. Pol.* 50(5):607-610, 1975.

9070 COMBINATIONS OF ANTIBIOTICS AND ANTIBACTERIAL AGENTS IN TREATMENT OF TUBERCULOSIS WITH SPECIAL EMPHASIS ON THE PROBLEM OF LIVER INJURY. *(It.)* Bettini, L.; Foddai, G.; Giaconi, G.; Pontiggia, P.; Foddai, A. (Ospedale Regionale Specializzato Tisiopneumologia s "E. Morelli," Sondalo, Italy). *Ann. Med. Sondalo* 21(2):67-110, 1973.

9071 CONCERNING HEPATIC LEAD INTOXICATION. CLINICAL AND EXPERIMENTAL STUDY. *(Fr.)* Morel, J. J.; Albahary, C.; Berry, J. P.; Galle, P.; Ripault, J.; Auriol, M.; Desoille, H.; Philbert, M. (Institut d'Hygiene Industrielle et de Medecine du Travail, 15, rue de l'Ecole de Medecine, 75006 Paris, France). *Arch. Mal. Prof. Med. Trav. Secur. Soc.* 35(6):609-630, 1974.

9072 PATHOPHYSIOLOGICAL SHIFTS IN LIVER INJURIES AND SURGERY. *(Rus.)* Borovkov, S. A. (Faculty Clinic Surgery, Ivano-Frankovsk Medical Inst., USSR). *Khirurgiia* (1):87-91, 1975.

9073 CONDITION OF INTRAHEPATIC BLOOD CIRCULATION IN DICHLORETHANE POISONING. *(Rus.)* Petrova, L. I.; Galkina, G. S. (Dept. of Therapy of Acute Poisonings, N. V. Sklifosovskiy Inst. of First Aid, Moscow, USSR). *Ter. Arkh.* 47(2):100-103, 1975.

9074 LIVER PATHOLOGY AND DRUGS. *(Rus.)* Tareev, E. M.; Semendyeva, M. E.; Mukhin, A. S.; Rozanova, L. B.; Blinkov, I. L.; Besprozvannyi, B. K. (no affiliation given). *Ter. Arkh.* 47(5):58-67, 1975.

9075 RHEOHEPATOGRAPHY IN THE DIAGNOSIS OF TOXICOCHEMICAL LESIONS OF THE LIVER IN PERSONS DEALING WITH TETRAMETHYLTHIURAM-DISULPHATE (TMTD). *(Rus.)* Kaskevich, L. M. (Inst. of Hygiene and Toxicology of Pesticides, Polymers and Plastic Materials, Kiev, USSR). *Gig. Tr. Prof. Zabol.* (6):16-19, 1975.

See also, 8982, 9109, 9113.

LIVER AND BILIARY TRACT

Acute Viral Hepatitis

9076 VIRAL HEPATITIS IN THE UNITED STATES, 1970-1973: AN ANALYSIS OF MORBIDITY TRENDS AND THE IMPACT OF HBsAg TESTING ON SURVEILLANCE AND EPIDEMIOLOGY. *(En.)* Bryan, J. A.; Gregg, M. B. (Center for Disease Control, Public Health Service, Dept. Health, Ed., Welfare, Atlanta, Ga.). *Am. J. Med. Sci.* 270(2):271-282, 1975.

An analysis of the morbidity and mortality data of viral hepatitis cases in the United States collected between 1970 and 1973 was presented. The report revealed a plateauing of case rates, no associated seasonal variation, a general geographic case distribution without urban or rural dominance, and the persistence of the highest rates in males 15-29 yr of age. HBsAg testing revealed that 24% of the hepatitis B cases may be misdiagnosed and that hepatitis B caused between 18% and 46% of all reported hepatitis. Thus, hepatitis B may account for as many as one-fifth to one-half of the viral hepatitis cases reported. Close personal contact was responsible for most cases of HBsAg-negative hepatitis. Parenteral drug abuse and blood transfusion were of continued importance in the dissemination of hepatitis B, but hepatitis B accounted for only one-half of all reported transfusion-associated hepatitis. Fatality rates for reported cases averaged 0.8% and appeared to increase with age. There was no difference in rates between HBsAg-positive and negative patients.

9077 THE EPIDEMIOLOGY OF VIRAL HEPATITIS: AN OVERVIEW. *(E.)* Mosley, J. W. (University of Southern California Sch. of Medicine, Los Angeles, Calif.). *Am. J. Med. Sci.* 270(2):253-270, 1975.

A summary of the epidemiologic data of viral hepatitis is presented, based on recent research and worldwide statistics. Hepatitis A virus (HAV) seems to be maintaining itself in human populations *via* serial propagation *vs* a carrier reservoir. The carrier intestinal state is epidemiologically unimportant, and there is no proof of viremic carriers. The epidemics reported from Greenland and Denmark point to lack of endemic transmission. The fecal-oral route is the usual mode of transmission, with other modes accounting for only small percentages of the cases. Distribution of HAV appears to be worldwide and evidence suggests a close relation among geographically unrelated strains. The epidemiologic characteristics include: 1) a cyclic tendency; 2) age-specific attack rates with the young at highest risk; 3) seasonal cycles; 4) higher rates in rural areas; 5) high secondary attack rates among household members; 6) reduced incidence with gamma globulin use; and 7) low case-fatality rates. No proof exists for a hyperendemicity pattern. Long-term incidence appears to show a downward trend. Hepatitis B virus (HBV) shows a high prevalence worldwide. Possible extra-human reservoirs exist, as evidenced by acute and chronic HBV infections induced in chimpanzees. A carrier state is present in at least 5 to 10% of the infected. Subtle percutaneous transmission of HBV beyond the more overt forms, such as transfusion, have been identified. Possible insect vectors are under investigation. Secondary cases occur much less than with type A, and risk is low except for the infected person's close contacts. Fecal-oral, oral-oral, and sexual transmission also seem likely. The long-term trend of HBV is not so well defined as for HAV; however, the higher incidence in the 15 to 24 yr age group appears to be related to recent increases in illicit self-injection, and this may place the nonabuser population at risk. In addition, the distribution of incubation periods of HAV and HBV is not the expected bimodal curve, which suggests that a third viral type may be involved.

9078 LIVER DISEASE IN NONPARENTERAL DRUG ABUSERS. *(E.)* Cooper, A. D.; Niejadlik, D.; Huston, K. (United States Air Force Medical Center and Special Treatment Center, Lackland Air Force Base, Tex.). *JAMA* 233(9):964-966, 1975.

The incidence and severity of liver abnormalities were studied in 500 servicemen with a history of drug abuse, and the possible association of nonparenteral drug use with hepatitis was investigated. Liver function tests were performed on the men, who were between 17 and 25 yr old. Of the 500 men, 407 had used drugs in Southeast Asia (SEA group). Of those in the SEA group, 362 denied parenteral abuse; of the 93 in the non-SEA group, 70% denied needle use. The main forms of drug abuse in the nonparenteral group were sniffing and smoking heroin, and marijuana smoking. The most commonly abnormal liver function test was the SGOT. Needle users had a high incidence of SGOT elevation (71% of the SEA group and 56% of the non-SEA group). Of the 362 nonparenteral users in the SEA group, 42% had elevated SGOT; of the 93 nonparenteral users in the non-SEA group, 40% had SGOT elevation. Eight patients had a positive test for hepatitis B surface antigen (HBsAg), with an overall frequency of 1.6%. All of these positive tests were from the SEA group. The fact that most HBsAg-positive patients denied needle exposure suggests either that the histories were inaccurate or that the subjects had acquired the infection by the nonparenteral route. The latter explanation is favored. Alkaline phosphatase was abnormal in 14%. All but two of these had an abnormal SGOT level. The inclusion of further tests did not seem to add significantly to the sensitivity of case findings provided by the SGOT values. Eighteen of 34 liver biopsy specimens were read as classic viral hepatitis. Fifteen specimens showed a wide array of morphological changes with no consistent pattern. At follow-up tests three months later, 35 men responded for tests; of these, 30 still showed abnormal SGOT values. The elevated SGOT value in over 40% of a large group of nonparenteral drug abusers had not been previously noted. That this abnormality is a result of drug abuse and not of residence in SEA is suggested by the similar incidence among patients not in SEA. The finding of a high incidence of hepatitis in a military community of nonparenteral drug abusers may have important implications for civilian physicians.

9079 A LARGE FOOD-BORNE OUTBREAK OF HEPATITIS A: POSSIBLE TRANSMISSION VIA OROPHARYNGEAL SECRETIONS. *(E.)* Levy, B. S.; Fontaine, R. E.; Smith, C. A.; Brinda, J.; Hirman, G.; Nelson, D. B.; Johnson, P. M.; Larson, O. (Minnesota Dept. Health, 717 Delaware St. SE, Minneapolis, Minn. 55440). *JAMA* 234(3):289-294, 1975.

A large, food-borne outbreak of hepatitis A is reported. Between April 6 and 22, 1974, 12 cases of hepatitis A were reported to the Minneapolis Health Department. Seven of the cases were among the 500 employees of the same department store; and at least five persons had eaten in the store's basement restaurant, in which the earliest case worked as a sandwich maker. The patients' clinical data were reviewed, and a questionnaire covering clinical and epidemiologic information was administered to the affected patients, the unaffected store employees, and 90 employees of a nearby store who had eaten in the store in question after February 1. A follow-up study was conducted to determine the secondary attack rate among household contacts of the patients and to determine the duration of illness. Of a total of 163 cases of hepatitis A reported between April 16 and May 24, 1974, 106 had illness associated with having eaten at the department store ten days to eight wk before the onset of symptoms. The median duration of illness in these 106 patients was 54 days, the median absence from work or school was one month, and none of the patients were positive for hepatitis B surface antigen (HBsAg) or anti-HBs. The

median age of the patients was 34 yr and 2/3 were female. Illness was statistically associated with having eaten lunch at the department store restaurant; illness was also statistically associated with frequency of eating cold sandwiches, particularly those containing lettuce. The data of onset of illness in the sandwich-maker index patient and the dates of food consumption and onset of illness of the restaurant patrons were consistent with the accepted periods of infectivity and incubation for hepatitis A. The index patient had generally good hygiene except that she frequently put her hands to her face and mouth during working hours. There were five secondary cases of hepatitis A, the secondary attack rate being much lower among household contacts who received immune serum globulin than among those who did not. It is likely that the primary outbreak was related to the contamination of food with infectious oropharyngeal secretions by the index subject. The immune serum globulin treatments probably prevented some secondary cases among the household contacts of the original patients.

9080 SEROLOGIC EVIDENCE FOR HEPATITIS B VIRUS INFECTION IN PATIENTS WITH HEMOPHILIA B: A MULTICENTER STUDY. *(E.)* Hoofnagle, J. H.; Aronson, D.; Roberts, H. (Div. Blood Blood Prod., Bureau Biol., Food Drug Admin., Bethesda, Md.). *Thrombos. Diathes. Haemorrh.* 33(3):606-609, 1975.

To study factors which may contribute to the development of hepatitis following multiple factor IX transfusions, the prevalence of hepatitis B surface antigen (HB_SAG), antibody to HB_SAg (anti-HB_S), and antibody to hepatitis B core antigen (anti-HB_C) was studied in sera from 160 hemophilia B patients from 9 centers in Europe, North America, and South America and in 28 separate lots of commercially prepared factor IX concentrate from 7 different manufacturers. HB_SAg was determined by radioimmunoassay, anti-HB_S by passive hemagglutination, and anti-HB_C by complement fixation. Of the 160 patients, 2.5% were positive for HB_SAg, 60% were positive for anti-HB_S, and 31% were positive for anti-HB_C; a total of 66% were positive for at least one of these factors. There was a positive correlation between the clinically assessed severity of the bleeding tendency and evidence of hepatitis B virus infection. The rate of serologic positivity also appeared to be positively correlated with patient age. The rates of HB_SAg, anti-HB_S, and anti-HB_C positivity in the patients with hemophilia B indicated a fairly uniform high rate of infection which was not dependent upon country of origin or source, manufacturer, or method of preparation of the factor IX concentrate used. It is doubtful that plasma donor screening will be totally successful, in preventing contamination of commercially-prepared factor IX concentrate with hepatitis B virus.

9081 SOME EPIDEMIOLOGICAL AND CLINICAL ASPECTS OF HEPATITIS B ANTIGEN AND ITS SUBTYPES. *(E.)* Nordenfelt, E. (Dep. Med. Microbiol., Univ. Lund, Sweden). *Scand. J. Infect. Dis.* 7(2):147-152, 1975.

The Australia or hepatitis B antigen (HBAg) and its subtypes are reviewed with respect to their epidemiology and the clinical aspects of the hepatitis associated with each. HBAg is a useful tool for epidemiological studies of hepatitis B, and a close association between this antigen and the infectious agent of hepatitis B is clear. However, it appears that all HBAg carriers are not necessarily carriers of the infectious agent. Of the 3 types of particles found in the serum of hepatitis B patients and carrier, the so-called Dane particles are present in large quantities in sera known to be infectious. The Dane particles consist of an outer coat which exhibits HBAg reactivity and an inner core which is antigenically distinct. The core is associated with DNA polymerase activity, and antibodies to it can always be detected in HBAg-positive viral hepatitis. The particles which carry HBAg reactivity have surfaces which are antigenically complex. One common specificity, *a*, and 2 pairs of mutually exclusive determinants, *d* and *y* and *w* and *r*, have been recognized and other possible specificities are under investigation. Three different phenotypes of distinct and independent transmissible variations of hepatitis B virus have been identified (*adw*, *adr*, and *ayw*); a fourth, *ayr*, has been found in a few cases, but there is no evidence that it represents a viable transmissible genotype. Epidemiological studies of these subtypes show 3 different geographic patterns. In the U.S. and Northern Europe, Dw (*adw*) predominates among blood donors and Yw (*ayw*), among addicts. In the Eastern Mediterranean and Middle East, Yw is found almost exclusively. In the Far East, DR (*adr*) seems to predominate, although subtypes Dw and Yw are also found. There is some evidence that subtype Y is more infectious than subtype D. Conflicting evidence of clinical differences in hepatitis caused by the different subtypes may be due to host variations and epidemiological factors.

9082 INTRAFAMILIAL SPREAD OF ASYMPTOMATIC HEPATITIS B. *(E.)* Szmuness, W.; Prince, A. M. (Lindsley F. Kimball Res. Inst., New York Blood Center, 310 E. 67th St., New York, N. Y. 10021). *Am. J. Med. Sci.* 270(2):293-304, 1975.

A survey of 751 families (more than 3,200 individuals) was conducted to investigate familial aggregation and segregation of hepatitis B (HB) infection. Families with an index-donor antigen positive showed a sex-age standardized prevalence of serologic evidence of HB ten times greater than those who were index-donor antibody positive and two to three times greater than control families with the same ethnic background. There was a high frequency (39-48%) of familial aggregation (2 or more cases). Familial prevalence and aggregation were associated with family size. The prevalence of antigenemia among siblings and parents (11-34%) was higher than among spouses (0-5%). Siblings matched to index-carriers by age demonstrated a higher antigen prevalence (4 to 6-fold higher) than unmatched siblings. Genetic segregation analyses supported the hypothesis for recessive inheritance. In two of three matings with antigen positive partners, all the progeny were antigen positive. It was concluded that both environmental and genetic factors influence the familial aggregation and segregation of HB.

9083 VERTICAL TRANSMISSION OF THE HEPATITIS B SURFACE ANTIGEN. *(E.)* Schweitzer, I. L. (Univ. Southern California Sch. Medicine, Los Angeles, Calif.). *Am. J. Med. Sci.* 270(2):287-291, 1975.

The vertical transmission of hepatitis B virus was studied in 63 pregnant or postpartum women with acute hepatitis B in the United States. Transmission occurred more frequently (70-100%) when the mother had acute hepatitis near delivery. The transmission was found to occur transplacentally or during delivery. Once infected, the infants remain hepatitis B surface antigen (HBsAg) carriers with persistent hepatitis indefinitely. The rate of HBsAg transmission from asymptomatic carrier mothers to their infants is as high as 40% on a worldwide basis. The highest rate is in Taiwan, where neonatal infection correlates with the height of complement fixation of surface antigen in the maternal serum. Of the 36 carrier-mother infant pairs followed in the U. S. for 3 to 42 months, three infants became HBsAg positive as neonates, two became positive between three and six months, and one became positive between six and 12 months of age. Extremely high antibody titers to HBsAg developed in two of the babies within the first year of life. Antigen or antibody positivity did not develop in 33 of the infants.

9084 HEPATITIS B (SURFACE) ANTIGEN IN MOTHERS AND THEIR INFANTS. *(E.)* Kew, M. C.; Marcus, R. G.; Macnab, G. M.; Bersohn, I. (Univ. of the Witwatersrand and Johannesburg Hosp., Johannesburg, South Africa). *S. Afr. Med. J.* 49(36): 1471-1473, 1975.

The possible transmission of hepatitis B virus from mother to infant, either *in utero* or postpartum, was evaluated in eight Caucasian women with hepatitis B surface antigen (HBsAg) in their blood. The blood of 4,525 patients was tested for HBsAg by counter immunoelectrophoresis (CIEP). Seven of the patients (0.16%) were asymptomatic, seropositive carriers of HBsAg, and one patient had polyarteritis nodosa associated with HBsAg antigenemia. Upon delivery, amniotic fluid, colostrum, placental homogenate and cord blood were tested for HBsAg. None of the infants developed clinical hepatitis, and three of the eight were seronegative. Seven were available for follow-up; only one had HBsAg positive serum, but was asymptomatic. Colostrum from four of the mothers was negative for the antigen. Amniotic fluid was positive by radioimmunoassay (RIA) and CIEP in one mother, and by RIA alone in another three. Placenta was also positive by both assays in one, and by RIA alone in another three. HBsAg was detected in cord blood in three cases. It is suggested that a carrier state may occur in the infants of infected mothers; however, the exact mode of transmission is uncertain.

9085 PREVALENCE OF HEPATITIS B ANTIBODY IN PROSTITUTES. *(E.)* Frosner, G. G.; Buchholz, H. M.; Gerth, H. J. (Hygiene-Inst., Univ. Tubingen, 74 Tubingen, W. Germany). *Am. J. Epidemiol.* 102(3):241-250, 1975.

To study the possibility of a venereal transmission of hepatitis B, sera from 258 female and ten male prostitutes, 258 female blood donors (matched controls), and 142 nuns were tested for hepatitis B antibody (anti-HBs) by passive hemagglutination. In addition, the presence of echovirus type 12 and adenovirus type 10 antibodies were determined by hemagglutination inhibition. Both anti HBs and HBsAg occurred more frequently in the prostitutes than in the controls. Of the prostitutes, 31% were anti-HBs-positive (of whom 24% resided in a brothel and 34% lived independently), compared to 10% of the matched blood donors. Three of the male prostitutes, 10% of the nuns living in a convent, and 15% of the nuns working as secondary school teachers were anti-HBs-positive. Hepatitis B antigen (HBsAg) was found in six of the prostitutes, in one nun, and in none of the blood donors. In the blood donors and prostitutes, the prevalence of anti-HBs was correlated with increasing age; the prevalence in the nuns (most of whom were older than 40 yr) was similar to that in the blood donors of the same age. Sixty-two percent of the prostitutes had had gonorrhea at least once, and 15% had had syphilis. Twenty-two percent of the prostitutes who had never had venereal disease were anti-HBs positive, whereas 36% of those who had had venereal disease were antibody positive. When these data were corrected for age, the prevalence of anti-HBs was significantly higher among those who had had more than three recorded venereal infections than among those who had had up to three infections. Similarly, prostitutes registered for more than three yr showed a significantly higher prevalence of anti-HBs than those registered for a shorter time. Antibodies to echovirus type 12 and adenovirus type 10 were also more frequent in prostitutes (27% and 42%, resp.) than in the blood donors (22% and 23%, resp.). There was no significant correlation between the prevalence of these antibodies and the incidence of venereal disease or length of registration. These data support the hypothesized transmission of hepatitis B during sexual contact.

9086 HEPATITIS TYPES B AND NON-B. EPIDEMIOLOGIC BACKGROUND. *(E.)* Mosley, J. W. (Univ. Southern California Sch. Medicine, Los Angeles, Calif. 90007). *JAMA* 233(9):967-969, 1975.

An epidemiologic study was performed using 34 patients, each of whom had been hospitalized for one bout of serologically defined type B acute viral hepatitis and one bout of non-B viral hepatitis. The detailed epidemiologic history obtained in all cases on admission emphasized personal contact, prior transfusion, and illicit self-injection. Of the 34 patients, 24 of whom were men, 20 had the type B episode first and 14 had the non-B episode first; the intervals between the first and second bouts did not differ. Twenty-four of the type B episodes were preceded by illicit self-injection, as were 22 non-B episodes. One non-B episode followed the transfusion of 2 U of blood by 86 days and another non-B episode followed numerous accidental punctures. Acquisition within the hospital through contact with

other patients was possible in one patient who consistently denied drug use; in this case, the non-B episode came first. Four additional patients had some form of personal contact with icteric hepatitis 1 to 6 months prior to their onsets; two of these bouts were type B and two were non-B. The remaining 16 bouts, eight each of type B and non-B, were preceded by no occurrence recognizable as a frequent mechanism by which any form of viral hepatitis is acquired. The results indicate that a diagnosis of type B hepatitis should be made only on the basis of serologic tests specific for hepatitis B virus infection. Other cases of sporadic disease in adults must be labeled "viral hepatitis, type unspecifiable."

9087 OCCURRENCE OF VIRAL HEPATITIS TYPE B AND TYPE NON-B IN THREE PATIENTS. *(E.)* Muller, R.; Stephan, B.; Helmstedt, D. (Hannover Medical Sch., Hannover, Germany). *J. Infect. Dis.* 132(2):195-199, 1975.

The occurrence of acute viral hepatitis type B in 3 patients convalescing from hepatitis B surface antigen (HB_sAg)-negative viral hepatitis is reported. Their sera were tested for IgG, IgM, enzyme activity, and HB_sAg; the latter was determined by radioimmunoassay and counterimmunoelectrophoresis. The first patient was a 33-yr-old woman who developed typical signs of acute viral hepatitis 29 days after transfusion of 11 units of whole blood for a uterine hemorrhage. For 3 weeks after hospitalization her serum was negative for HB_sAg and anti-HB_s; and she showed rapid clinical improvement. During the fourth week after hospitalization, the patient became positive for HB_sAg and remained positive for 7 weeks when she again developed signs of hepatitis; anti-HB_s appeared during the recovery period. The second patient was a 21-yr-old woman with symptoms suggestive of viral hepatitis followed, 8 days later, by jaundice. Tests for HB_sAg were negative. The patient recovered, but 87 days after onset again developed symptoms of hepatitis; she was then positive for HB_sAg. It is likely that exposure to 2 patients with acute HB_sAg-positive hepatitis during her hospitalization was the source of her second illness. The third patient was a 20-yr-old drug addict who was admitted with signs of acute viral hepatitis. She was negative for HB_sAg and made an uneventful recovery. The patient continued to inject a morphine mixture, and 2 months after onset was found to have HB_sAg-positive viral hepatitis. These cases support the concept of 2 distinctive types of viral hepatitis and provide evidence that patients can acquire viral hepatitis type B and type non-B simultaneously or within a short period. Patients with HB_sAg-positive and HB_sAg-negative hepatitis should be isolated from each other during the acute phase of the illness.

9088 KARYOMETRY OF LIVER BIOPSIES IN VIRUS HEPATITIS. *(E.)* Ranek, L.; Jensen, S. T.; Keiding, N. (Rigshospitalet, 9 Blegdamsvej, DK-2100 Copenhagen Ø, Denmark). *Acta Pathol. Microbiol. Scand.* [*A*] 83(5):477-486, 1975.

In order to quantify the hepatic nuclear variations associated with acute virus hepatitis, liver biopsies were taken from ten patients with clinically mild or moderate cases. The biopsies were taken in the acute phase of the disease, in the recovery phase, or later, and were assessed for nuclear size and the number of binuclear nuclei. The mean nuclear radius of diploid nuclei and the frequency of di-, tetra-, and octaploid nuclei were estimated by a parametric model of nuclear radii distributions. Liver cell nuclei of the acute phase were usually larger with greater size variation than the nuclei of the recovery phase. This pleomorphism could not be attributed to pyknotic and necrotic nuclei only as these types were not measured. It was suggested that increased nuclear metabolic activity was responsible for the nuclear enlargement. The first biopsies demonstrated a greater number of polyploid nuclei and binuclear liver cells, which indicated regenerative activity. No correlation was found between the severity of the disease (as assessed by liver histology and routine liver tests) and the degree of nuclear changes (i.e., size and frequency of polyploid or binuclear liver cells).

9089 PLATELET AND FIBRINOGEN SURVIVAL WITH ^{75}Se SELENOMETHIONINE IN ACUTE INFECTIOUS HEPATITIS. *(E.)* Musumeci, S.; D'Agata, A.; Panebianco, M. G.; Li Volti, S. (Dep. Pediatr., Univ. Catania, Italy). *Thromboe. Diathes. Haemorrh.* 33(3):493-500, 1975.

Simultaneous platelet and fibrinogen survival determinations with ^{75}Se-selenomethionine were performed in 2 normal subjects and in 8 children with acute infectious hepatitis of intermediate severity. Fibrinogen survival alone was estimated in 9 hepatitis patients, 7 of whom were receiving heparin treatment (300 U/kg/day, i.v.). ^{75}Se-selenomethionine (2.5 μCi/kg) was injected i.v. into the subjects, and blood samples were collected 1, 3, and 6 hr later and daily thereafter for platelet and fibrinogen survival determinations. Determinations were also made of the prothrombin time, coagulation time, clot retraction time, platelet factor III availability, plasma fibrinogen, euglobulin lysis time, platelet count, and fibrin monomers. The platelet counts were lowest in a patient who also had measles and in 2 patients with thalassemia major. The retraction time, coagulation, and prothrombin time were slightly prolonged in all patients, fibrinogen levels were within normal limits, and the euglobulin lysis test was negative, as was the test for fibrin monomers. Platelet survival was normal in 7 of 8 patients and was reduced (4.6 days) only in the patient who also had measles. The fibrinogen survival time was markedly reduced in all but one of the hepatitis patients (mean 1.81 ± 0.69 days versus 6-6.5 days in the controls). Fibrinogen survival was also markedly reduced, to a mean of 2.37 days, in the heparin-treated patients. The fibrinogen turnover was 0.58-0.61 mg/ml/day in the controls and 0.59-2.80 mg/ml/day in the hepatitis subjects. In 3 patients, a sudden reappearance of ^{75}Se-selenomethionine in the fibrinogen was observed, probably due to reutilization of the injected ^{75}Se after the first few days. These results are consistent with the hypothesis that in acute infectious hepatitis the de-

creased survival and turnover of fibrinogen may be due to a pathological pathway of defibrination which is independent of thrombin or plasmin.

9090 EXTRAHEPATIC MANIFESTATIONS OF VIRAL HEPATITIS WHICH ARE INDEPENDENT OF HEPATIC LESIONS. *(Fr.)* Paris, J. (Univ. Hosp. Center, Lille, France). *Cah. Med.* 15(15):1041-1047, 1974.

The effects of viral hepatitis on organs other than the liver are reviewed. It is suggested that viral hepatitis could have entered the liver through the duodenum. Sometimes the extrahepatic biliary ducts are affected during hepatitis; cholecystitis, pediculitis, and choledochitis have been observed. Aftereffects of hepatitis such as hyposthenic dyspepsia and postprandial diarrhea were noted. Pancreatic involvement paralleling hepatitis causes disturbances in glucose metabolism, diabetes, and amylase modification. In some cases, neuropsychic effects develop early in the disease; in other cases, the neuropsychic effects are late in manifesting themselves. Hepatic insufficiency can lead to both cardio-respiratory and renal problems. Viral hepatitis has a definite effect on the hematopoietic system in the form of leucopenia with thrombocytopenia and late medullary insufficiency. If the patient is pregnant, the disease must be dealt with on both the maternal and fetal levels. Thus, viral hepatitis has numerous extrahepatic effects in man.

9091 ABSOLUTE ERYTHROCYTOSIS IN EARLY INFECTIOUS HEPATITIS. *(E.)* Bank, H.; Passwell, J. (Tel Aviv Univ. Medical Sch., Tel Aviv, Israel). *Med. Chir. Dig.* 3(5):321-323, 1975.

Serial hematocrit estimations and blood and erythrocyte volume studies were performed on 17 young men with clinically typical viral hepatitis to determine whether an apparent rise in erythrocyte, hemoglobin, and hematocrit values was due to an absolute elevation in erythrocyte volume or to dehydration. Blood volume investigations with radioactive chromium (^{51}Cr) were performed by the closed method soon after hospitalization and at least two wk after discharge. The mean blood volume was significantly reduced after discharge (69 ml/kg) compared with the value obtained on admission (75 ml/kg); the patients with the largest blood volumes on admission showed the greatest decrease on repeat examination. The mean proportion of erythrocyte volume in the blood (47%) was also greater on admission than after discharge (42%), while the mean plasma volume estimations were similar at both examinations. In 4 of 7 patients examined, there was a rise in hematocrit following admission, and in two patients the hematocrit showed no such rise; in all seven, the hematocrit fell considerably over the following two wk. The data indicate that dehydration is probably not the cause of the observed rise in erythrocyte volume in these patients.

9092 LYMPHOCYTE RESPONSE TO HEPATITIS B SURFACE ANTIGEN. FINDINGS IN HEPATITIS AND INDIAN CHILDHOOD CIRRHOSIS. *(E.)* Chandra, R. K. (All India Inst. Medical Sci., New Dehli, India). *Arch. Dis. Child.* 50(7):559-561, 1975.

The specific reactivity of lymphocytes to hepatitis B surface antigen (HBsAg) was investigated in Indian children. Lymphocyte delayed hypersensitivy response to phytohemagglutinin (PHA) and HBsAg was evaluated by leukocyte migration inhibtion and DNA synthesis. Four groups of children were studied: ten boys (aged 11-36 months) presented with Indian childhood cirrhosis and with HBsAg present in the serum at some stage of their illness; ten boys (aged 15-36 months) with HBsAg positive hepatitis (four to 24 weeks) studied after clinical recovery; four children with postnecrotic cirrhosis, negative for HBsAg and anti-HBs; and 10 children (controls) with no history of jaundice or blood transfusion, matched for sex and age, and negative for HBsAg and anti-HBs. HBsAg and anti-HBs were detected initially by counterimmunoelectrophoresis and confirmed by radioimmunoassay. Lymphocyte cultures were set up in triplicate. To one set of cultures, PHA was added in doses of 3, 30, and 300 µg/ml and the cells were harvested at 96 and 120 hr. For analysis of results, values of cultures stimulated with 30 µg/ml PHA and examined at 96 hr were used, since these culture conditions yielded maximum counts. To the second set of cultures, purified HBsAg was added in a concentration of 200 µg/ml and the cells were examined at 120 hr. The third set was kept as unstimulated controls. DNA synthesis was measured by [^{3}H]thymidine incorporation using a scintillation counter. The morphology of 200 cells was studied for blast transformation. Lymphocytes of children convalescing from HBsAg-positive hepatitis showed a significant increase in DNA synthesis when cultured in the presence of HBsAg. The increase was confirmed by examination of cell morphology to detect lymphoblasts. Cells of healthy controls negative for HBsAg and anti-HBs, and cells of HBsAg-positive cirrhotic patients showed no increased [^{3}H]-thymidine incorporation on stimulation with antigen. With PHA, the lymphocyte transformation response was comparable in control and hepatitis groups, and slightly, but significantly, reduced in cirrhotics. Leukocytes of convalescent patients with hepatitis demonstrated significant inhibition of migration in the presence of HBsAg. The migration of cells obtained from cirrhotics was comparable to that of controls, confirming the lack of hypersensitivity to HBsAg in each of the groups. It is suggested that the lack of immune reactivity to HBsAg, perhaps determined genetically, may be a significant factor in the evolution of cirrhosis in Indian children.

9093 IMMUNOLOGIC MECHANISMS IN HEPATITIS B ASSAYED BY ANTIGEN-BINDING LYMPHOCYTES. *(E.)* Vyas, G. N.; Roberts, I.; Mackay, I. R.; Gust, I. D. (Dept. Clinical Pathology and Laboratory Medicine, Univ. California, San Francisco, Calif. 94143). *Am. J. Med. Sci.* 270(2):241-246, 1975.

The immune mechanisms involved in hepatitis B virus (HBV) infection were studied in individuals with and without hepatitis. Peripheral blood was collected from 16 subjects and tested for HBsAg, anti-HBs,

anti-HBc, and ^{125}I-labeled HBsAg binding lymphocytes (ABL). Anti-HBc was detected in all patients positive for HBsAg. High counts of ABL correlated with high titers of anti-HBs in the serum; low counts characterized most cases of chronic hepatitis and the chronic carrier-state for HBsAg. Low counts may represent a tolerance to HBsAg in ABL carriers. The presence of anti-HBc was not related to ABL counts. Thus, the ABL assay for HBsAg and HBcAg may provide a useful tool for understanding the immune mechanism of HBV infection.

9094 IMMUNOLOGICAL STUDIES IN CHILDREN WITH ACUTE VIRAL HEPATITIS. *(E.)* Kanakoudi, F.; Nikolaidis, A.; Daniilidis, B.; Manios, S.; Zurukzoglu, S. S.; Cassimos, C. (Paediatric Clinic, Aristotle Univ., Thessaloniki, Greece). *Clin. Exp. Immunol.* 22(1):78-83, 1975.

Smooth muscle autoantibodies (SMA), hepatitis B antigen (HBAg), serum immunoglobulin levels, and delayed cutaneous reactivity to dinitrochlorobenzene (DNCB) were investigated in children with acute viral hepatitis in order to examine the relation between the impairment of delayed-type hypersensitivity and the HBAg carrier state. Of 116 cases (65 boys, 51 girls) of sporadic acute viral hepatitis, HBAg was detected in 21 and SMA in 98 children (the sera was obtained during the first or second week after the onset of jaundice). HBAg was found in 17 of the 18 (94.4%) SMA-negative children and in 4 of the 98 SMA-positive patients. There was no relation between the presence of SMA and sex and age of the patients or the serum bilirubin and transaminase levels. SMA usually did not remain for more than six weeks after the onset of jaundice. Immunoglobulin M (IgM) levels were elevated during the acute phase of the illness and were within normal limits during the recovery phase in 28 out of 41 children. A negative correlation was observed between the presence of SMA, elevated serum IgM levels, and the presence of HBAg in the same patients. The DNCB skin test was positive in all 52 patients without serum HBAg and in 20 out of 21 patients with serum HBAg. Thus, it appeared that there is no gross impairment of the cell-mediated immunity in acute viral hepatitis. It was concluded that hepatitis A is associated with SMA production and an increase in serum IgM levels while hepatitis is associated with HBAg.

9095 IMMUNOPATHOLOGICAL ASPECTS OF HEPATITIS TYPE B. *(E.)* Nowoslawski, A.; Krawczynski, K.; Nazarewicz, T.; Slusarczyk, J. (Natl. Inst. Hygiene, Warsaw, Poland). *Am. J. Med. Sci.* 270(2):229-239, 1975.

Tissue samples from 180 unselected necropsy cases of various forms of hepatitis were examined by histopathology and immunofluorescence. The extent of liver damage was correlated with the presence of hepatitis B virus (HBV) antigens and HBV antigen-immune complexes. Hepatitis forms studied included acute fulminant hepatitis (28 patients), subacute hepatitis (48), acute fatal hepatitis (24), chronic aggressive hepatitis (26), liver cirrhosis (49), and "minimal" hepatitis (5). Both hepatitis B surface antigen (HBsAg) and core antigen were detected in 101 patients (56.1%), 77 of whom (76.2%) possessed lesion-bound immune complexes of HBsAg in the liver and extrahepatic locations (i.e., activated germinal centers of lymph nodes and spleen, focal hyaline lesions of splenic and renal arterioles, necrotic and/or proliferative lesions of small and mid-sized arteries, and kidney glomeruli with mild proliferative and degenerative lesions). The amounts of HBsAg in the liver and the liver damage were inversely correlated. Liver damage was directly proportional to the amount of HBsAg immune complexes in the liver and indirectly proportional to their amount in the extrahepatic locations and to the severity of the lesions at these sites. Thus, the immune humoral response to HBV may be an important factor in the pathogenesis of various forms of hepatitis.

9096 IMMUNOHISTOCHEMICAL DEMONSTRATION OF HEPATITIS B CORE AND SURFACE ANTIGENS IN PARAFFIN SECTIONS. *(E.)* Huang, S. (Dept. Pathology, McGill Univ., Montreal, Canada). *Lab. Invest.* 33(1): 88-95, 1975.

Immunohistochemical methods for the demonstration of the two types of hepatitis B antigen (surface antigen, HBsAg, and core antigen, HBcAg) were investigated in liver tissues fixed in 10% formalin and embedded in paraffin or frozen unfixed. In the unfixed tissues, both direct and indirect immunofluorescent staining methods were performed using anti-HBc and anti-HBs sera. In one case, it was necessary to elute a deposition of autologous antibody (IgG) with 0.1 M glycine-HCl (pH 1.2) before incubation with human anti-HBc serum. Three sets of neutralizing controls were carried out using anti-HBc, anti-HBs, and normal liver tissue homogenates. There was stronger fluorescence in unfixed tissue in all cases. The indirect immunofluorescent method was found to be more sensitive than the direct method. Paraffin sections were found to be superior to unfixed frozen sections because the block could be stored easily and block size could be varied to include the desired examination area. It is concluded that immunohistochemical staining for core antigen provides an additional means for elucidating histopathological changes in Type B viral hepatitis.

9097 IMMUNOPEROXIDASE LOCALISATION OF HEPATITIS B ANTIGEN (HB) IN FORMALIN-PARAFFIN PROCESSED LIVER TISSUE. *(E.)* Burns, J. (Radcliffe Infirmary, Oxford, England). *Histochemistry* 44(2): 133-135, 1975.

Hepatitis B antigen (HB) was localized in paraffin-embedded liver tissue previously fixed in formalin by the unlabeled antibody-enzyme (PAP) method. The biopsies included chronic hepatitis, chronic biliary obstruction, α,1-antitrypsin deficiency, alcoholic liver disease, hemachromatosis, carcinoma deposits and normal liver. Thin sections were subjected to the following: (a) rabbit anti-HB serum, (b) rabbit anti-HB serum absorbed with a commercial and non-commercial source of HB, and (c) normal rabbit serum

in the first immune serum stage of the full PAP method. A characteristic cytoplasmic staining reaction was observed in several hepatocytes in some cases of chronic hepatitis; none of the hepatocytes in any of the other liver biopsies gave a similar reaction. Positive cells demonstrated fine or coarse granular staining in some hepatocytes and homogeneous "ground glass" appearance in others. The staining was either restricted to the sinusoidal pole or honeycomb in appearance. The distribution of positively stained hepatocytes also varied. Relatively smaller numbers were found in chronic aggressive hepatitis and larger numbers, read subjectively, were found in chronic persistent hepatitis. Nonspecific staining was negligible except for some weak staining of necrotic cells that were occasionally positive in hepatitis, alcoholic liver disease, carcinoma deposits, and of bile if sera were not optimally diluted. No positive staining of Kupffer cells or nuclear staining was evident. When the absorbed rabbit anti-HB or normal rabbit serum was substituted for the unabsorbed rabbit anti-HB serum in the first immune stage of the full PAP procedure, the hepatocytes did not stain to any great extent in any of the liver tissues examined. Both the active and inactivated HB gave a positive passive hemagglutination test for HB with the unabsorbed rabbit anti-HB and the horse anti-HB serum. Only those patients whose liver biopsies gave a positive PAP reaction for HB were found to have had a serological history or Australia antigen by both hemagglutination and immunodiffusion tests. The results demonstrate the facility of routine formalin-fixed paraffin-embedded material to retain a demonstrable amount of antigen of immunocytochemical, histological and clinical import.

9098 PRODUCTION OF ANTIBODY TO INDIVIDUAL POLYPEPTIDES DERIVED FROM PURIFIED HEPATITIS B SURFACE ANTIGEN. *(E.)* Dreesman, G. B.; Chairez, R.; Suarez, M.; Hollinger, F. B.; Courtney, R. J.; Melnick, J. L. (Baylor Coll. Medicine, Houston, Tex. 77025). *J. Virol.* 16(3):508-515, 1975.

Several of the major polypeptides derived from purified hepatitis B surface antigen (HBsAg) were purified and the antibody response elicited by them was studied in guinea pigs. Purified preparations of HBsAg were solubilized with sodium dodecyl sulfate and urea under reducing conditions, after which they were fractionated by preparative sodium dodecyl sulfate-urea polyacrylamide gel electrophoresis (PAGE). Pools of the individual fractions eluted from the preparative PAGE were then concentrated and purified further by analytical PAGE. Five purified polypeptides were thereby isolated from HBsAg types *adw* and *ayw;* these polypeptides had molecular weights of 19,000, 24,000, 27,000, 35,000, and 40,000. Each preparation was emulsified in Freund complete adjuvant and injected into the footpads of Hartley strain guinea pigs; the antibody titer to each was measured by radioimmunoassay. The 19,000 molecular weight subunit obtained from both types of HBsAg failed to elicit a measurable antibody response, but the other three polypeptides derived from the *ayw* particles elicited group-specific antibody responses. Similar group-specific reactivities were obtained with anti-*adw*-35,000 and anti-*adw*-40,000 molecular weight polypeptide sera. However, guinea pigs immunized with the 19,000 and 24,000 molecular weight polypeptides of the *adw* type produced antibody that reacted preferentially with *adw* particles. This indicates that either these subunits carry predominantly *d* determinants or that, because of the low levels of material used for inoculation, no immune response or an undetectable one was elicited to the *a* or *w* components. HBsAg subunits which appear to be free of antigenically cross-reactive host cell components and which do not contain infectious viral nucleic acid may yield an effective hepatitis B vaccine.

9099 HBcAg, ANTI-HBc, AND DNA POLYMERASE ACTIVITY IN TRANSFUSED RECIPIENTS FOLLOWED PROSPECTIVELY. *(E.)* Hollinger, F. B.; Dreesman, G. R.; Fields, H.; Melnick, J. L. (Baylor Coll. Medicine, Houston, Tex. 77025). *Am. J. Med. Sci.* 270(2):343-348, 1975.

Post-transfusion hepatitis B patients (345, 16 yr or older) were followed prospectively after blood transfusion. Serum hepatitis B core antigen (HBcAg), antibody to core antigen (anti-HBc), and DNA polymerase activity were measured in order to evaluate the role of hepatitis B virus (HBV) in post-transfusion hepatitis. The study revealed that blood testing with a sensitive radioimmunoassay reduced the incidence of post-transfusion hepatitis B infection by 50%. HBV infection was modified or aborted in the presence of pre-existing antibody to hepatitis B surface antigen (HBsAg). There was no increased risk of post-transfusion hepatitis B when blood containing anti-HBs was transfused. HBcAg and/or DNA polymerase activity, HBsAg, and anti-HBc were detected in the sera of all recipients tested who developed liver enzyme abnormalities. DNA polymerase usually occurred in the early stages of incubation; HBcAg was usually associated with increasing enzymatic evidence of liver damage. This suggests a release of core structures by the hepatocytes. The presence of DNA polymerase without detectable HBcAg may be a result of the presence of intact Dane particles in the sera that mask the core antigen. In the sera of 24 other recipients who developed abnormal transaminase activities, there was no serological evidence of hepatitis B. Evidence of exposure to hepatitis A antigen following transfusion in two of the 24 recipients was demonstrated by immunoelectron microscopy.

9100 TRANSFUSION OF HEPATITIS B IMMUNE COMPLEX-CONTAINING BLOOD IN HIGH HBV PREVALENCE POPULATIONS. *(E.)* Simons, M. J. (WHO Immunology Res. Training Center, Univ. Singapore, Rep. Singapore 3). *Am. J. Med. Sci.* 270(2):349-354, 1975.

The association between post-transfusion hepatitis and hepatitis B surface antigen (HBsAg) was investigated. Data from several countries where there is a high prevalence of hepatitis B virus (HBV) was analyzed. In one study performed in Singapore, HBV immunity was found to provide protection against in-

fection following HBsAg-positive blood transfusions; a greater percentage of the immune recipients failed to develop or developed only transitory antigenemia. Hepatitis developed in 40 of 66 patients (61%) who received HBsAg-positive units; 37 of these 40 (93%) had subclinical cases. Six of the patients who received HBsAg-containing units had HBsAg in the pretransfusion serum. In four of these six, HBsAg disappeared early in the post-transfusion period (24 hr-4 days) and anti-HBsAg was detected immediately after the disappearance; the anti-HBsAg remained for the duration of the study (24-28 weeks). The HBsAg immune complexemia, detectable by radioelectrocomplexing in approximately 80% of HBsAg-positive blood donors, may be related to the change in HBV immune status. The verification of this HBsAg "cure" would indicate the use of the inactivated viral subunit antigen as a vaccination and as immunotherapy for the HBsAg-positive carrier and patient.

9101 POST-TRANSFUSION HEPATITIS FOLLOWING THE USE OF PROTHROMBIN COMPLEX CONCENTRATES. *(E.)* Roberts, H. R.; Blatt, P. M. (Univ. North Carolina Sch. Med., Chapel Hill, N.C.). *Thromb. Diath. Haemorrh.* 33(3):610-616, 1975.

Data are reviewed which suggest an increased incidence of post-transfusion hepatitis in patients receiving infusions of concentrates rich in factor IX and the other prothrombin complex factors. The most likely cause of post-transfusion hepatitis is the hepatitis B virus, which has at least 2 antigens: the hepatitis B surface antigen (HB_SAg); and the hepatitis B "core" antigen (HB_CAg) or Australian antigen. HB_SAg can be detected in about 80% of patients with hepatitis B if looked for at frequent intervals during the period of incubation. Detection of this antigen or antibodies to either of the hepatitis B antigens are important diagnostic criteria for hepatitis B, as are SGPT levels over 4 times the normal levels in the absence of other known causes of elevated SGPT. When radioimmunoassay is employed, the incidence of hepatitis B virus in normal volunteer blood donors is about 4%, and as little as 0.0004 ml of contaminated plasma can be infective. An increased incidence of clinical post-transfusion hepatitis has been associated with the use of factor VIII and factor IX concentrates. In the United States, up to 75% of post-transfusion patients receiving concentrates containing factor IX have developed hepatitis. Although the experience in the U.S. may differ somewhat from that observed in other countries, there appears to be a substantial risk of hepatitis, even with European preparations. It is likely that even those concentrates which are negative for hepatitis B virus when screened by the sensitive radioimmunoassay technique are capable of transmitting hepatitis B. The incidence of hepatitis B in post-transfusion patients can, however, be reduced by using sensitive methods to screen blood donors and the concentrates for hepatitis B antigen and antibody. After transfusion, a careful follow-up for detection of anicteric hepatitis should be performed on all patients; this should include sensitive liver function tests. It is recommended that prothrombin complex concentrates by used only when patients with hemophilia develop life-threatening hemorrhagic episodes and when the risk of hemorrhage outweighs the risk of hepatitis. Attempts should also be made to improve the preparation of factor IX concentrates.

9102 THE EMERGING PATTERN OF POST-TRANSFUSION HEPATITIS. *(E.)* Alter, H. J.; Holland, P. V.; Purcell, R. H. (Natl. Institutes of Health, Bethesda, Md. 20014). *Am. J. Med. Sci.* 270(2):329-334, 1975.

A review of sequential studies involving patients undergoing open-heart surgery was undertaken to interpret the clinical and serologic events of post-transfusion hepatitis. The relative value of tests for hepatitis B surface antigen (HBsAg) was also assessed. Patients were followed weekly to biweekly for the first three months after surgery and then monthly for the next three. Those developing alanine amino transferase (SGPT) elevations were followed longer and more frequently. The first phase of the study compared commercial and volunteer donor blood. Fifty-one percent of 82 patients receiving commercial blood developed hepatitis, while none of 28 patients receiving volunteer blood developed the disease. The risk of hepatitis and the icteric risk were 30.6 and 9.5 cases per 1,000 U transfused. Phase II began when counterimmune electrophoresis (CEP) became available as an HBsAg screen. Sixty-nine percent of 16 patients receiving HBsAg positive blood and 25% of 76 patients receiving negative blood developed hepatitis. In phase III, exclusion of all paid donors led to a hepatitis and icteric risk of 3.7 and 1.3 cases per 1,000 units. The residual cases were felt to be either unrelated to B virus or to false negative screen. Phase IV began when radioimmunoassay became available, and consisted of 108 patients transfused with volunteer donor, CEP negative blood. Donor blood was retrospectively tested by RIA in hepatitis cases. Twelve cases of hepatitis were found, four of them icteric, representing a hepatitis and icteric rate of 6.4 and 2.1 cases per 1,000 U. Of the 12 cases, four were type B and eight were non-B. Comparing types B and non-B, they were found to have similar incubation times. Type B was more acutely severe and more frequently icteric than was non-B. The etiology of non-B hepatitis is obscure but was shown to be unrelated to cytomegalo, Epstein-Barr and Type A viruses. It is concluded that despite CEP testing four to six cases per 1,000 units transfused occur and that most type B hepatitis can be prevented by RIA screening. There is also evidence for the existence of a non-A, non-B hepatitis virus.

9103 HEPATITIS B SUBUNIT VACCINE: A PRELIMINARY REPORT OF SAFETY AND EFFICACY TESTS IN CHIMPANZEES. *(E.)* Purcell, R. H.; Gerin, J. L. (Natl. Inst. of Allergy and Infectious Diseases, Bethesda, Md.). *Am. J. Med. Sci.* 270(2):395-399, 1975.

The safety and efficacy of hepatitis B surface antigen (HBsAg) vaccine in chimpanzees was evaluated.

Two subunit vaccines were prepared from HBsAg subtypes *ayw* and *adr*. To render each vaccine safer, the infectious Dane particles were removed. The 22 nm noninfective HBsAg of each type was purified by isopycnic banding in cesium chloride followed by rate zonal separation in sucrose and stabilization in human serum albumin. Aliquots of each preparation were inactivated in 1:2,000 formalin at 37 C for 96 hr. Aliquots of active serum and inactivated vaccine were tested for potency in guinea pigs. To determine if B virus infectivity was completely removed from the vaccines, seven chimpanzees were inoculated with one of the following: inactivated or activated *ayw* vaccine; inactivated *adr* vaccine; or saline-albumin solution. Vaccine dosages were 1 ml s.c., containing 20 µg HBsAg, and boosters were given at one month. None of the *ayw*- or *adr*-vaccinated animals developed evidence of hepatitis, while those given *ayw* serum developed the disease. To determine if the vaccines were protective, the same animals were inoculated i.v. with $10^{3.5}$ infectious doses of subtype *ayw* hepatitis B virus at 24 weeks after vaccination. Both of the unvaccinated animals developed hepatitis B, while none of the vaccinated animals did. The animal given the *adr* vaccine developed antibody to the core antigen and an increased titer of HBsAg antibody, but did not develop hepatitis clinically. Immunization with purified HBsAg thus appears to stimulate protection to hepatitis B virus infection.

9104 VIRAL HEPATITIS TYPE B: PROSPECTS FOR ACTIVE IMMUNIZATION. *(E.)* Krugman, S. (New York Univ. Medical Center, New York, N. Y.). *Am. J. Med. Sci.* 270(2):391-393, 1975.

Based on recent findings, the prospects for active, human immunization against type B hepatitis have improved. Studies with heat-inactivated type B virus (strain MS-2) revealed that it retained its antigenicity and was noninfectious. When this serum was used in an active immunizing procedure, it was protective, and was associated with a more attenuated hepatitis B infection and a decreased hepatitis B surface antigen (HBsAg) carrier rate. Studies using liver function and serologic tests to assess immunity of parenterally exposed individuals have shown that 20 of 29 persons receiving the MS-2 heat-inactivated hepatitis B serum were protected; all 20 developed anti-HBs and all were disease-free after two yr. There was evidence of infection in an unimmunized group. The MS-2 serum has been shown to induce antibody to the HBsAg, and not to the core antigen; the former is protective, while the latter is not. The preparation of active subunits of HBsAg suggests that the development of a synthetic HBsAg peptide vaccine is possible. The identification of various subtypes of HBsAg has raised the possibility of cross-immunity. These recent developments indicate that active immunization could be achieved with purified HBsAg or one of its polypeptides or glycolipids.

9105 PURIFIED AND INACTIVATED HUMAN HEPATITIS VACCINE: PROGRESS REPORT. *(E.)* Hilleman, M. R.; Buynak, E. B.; Roehm, R. R.; Tytell, A. A.; Bertland, A. U.; Lampson, G. P. (Merck Institute for Therapeutic Research, West Point, Pa. 19486). *Am. J. Med. Sci.* 270(2):401-404, 1975.

Recent developments concerning a practical hepatitis B vaccine intended for large-scale human use are described. Antigen was separated from pooled plasma by two cycles of isopycnic banding and rate zonal separation. Further purification was performed and resulted in destruction of most of the viral infectivity. Purified antigen in a concentration of 20 µg/ml of protein was treated for 72 hr at 36 C with 1:4000 formalin and was proved to be free of contaminants. Six chimpanzees were inoculated i.v. with 1.0 ml each of the vaccine and six others were infected with live B virus. All of the latter and none of the former developed hepatitis B within six months. Four of six other chimpanzees studied for antibody levels developed acceptable titers after one 20 µg dose and five of the six did so after three repeated doses. It is inferred that the purified hepatitis vaccine is potent, safe and suitable for the first trials in humans.

9106 ATTEMPT TO PREVENT HEPATITIS BY USING SPECIFIC ANTI-HBs IMMUNOGLOBULIN. *(E.)* Couroucé-Pauty, A. M.; Delons, S.; Soulier, J. P. (Centre Nationale de Transfusion Sanguine, 6, rue Alexandre Cabanel, 75015 Paris, France). *Am. J. Med. Sci.* 270(2):375-383, 1975.

An attempt was made to prevent hepatitis by using anti-hepatitis B immunoglobin (HB IG). Patients who had been contaminated by a hepatitis B surface antigen-positive blood transfusion as well as contaminated laboratory and hospital staff members were studied. HB IG was extracted from donor serum containing the surface antigen antibodies. From this, HB IG was prepared and checked for titer. Twenty-nine patients transfused with hepatitis B antigen blood received a single i.m. injection of HB IG (0.16 ml/kg). Of these, two developed clinical hepatitis B, two developed anicteric antigenemia, and 11 developed antibody to the surface antigen. Three patients demonstrated an isolated increase in transaminases. Of four patients receiving a single i.m. injection of 0.5 ml/kg HB IG, none developed hepatitis, but two developed high titer antibodies. Of 80 contaminated staff members receiving 5 ml i.m. of HB IG, eight developed antibodies, two developed hepatitis, and two developed increased transaminases. Ninety-three members of hemodialysis staffs exposed to hepatitis B were given 5 ml of HB IG i.m. every five weeks for the first four months, then every two months for eight months, then quarterly in the second yr. Of 90 staff members completing the treatment, none developed hepatitis or were antigen carriers. Eight developed antibodies. Three of eight unprotected staff members developed hepatitis B. Prior to this study, a hepatitis attack rate of 44% was found in the hemodialysis staff members. It is concluded that favorable protection is encountered in contaminated patients and staff with a single dose of HB IG; staff members working in a highly contaminated environment are protected by repeated doses.

9107 IMMUNOSUPPRESSIVE THERAPY IN PERSISTENT VIRAL HEPATITIS. *(It.)* Arcuri, F.; Paganini, G. (Ospedale Generale Regionale, Genoa, Italy). *Policlinica, Sez. Med.* 80(5):271-284, 1973.

Azathioprine was administered to 23 patients (16 men and 7 women, aged 16-60 yr) with viral hepatitis which persisted for 16 to 74 days after the onset of symptoms. An initial dose of 50 to 100 mg/day was administered and, in some cases, this was increased to 200 mg/day. Azathioprine therapy was continued for 14 to 74 days. The initial serum transaminase values in these patients were not excessively high, but in most cases they had been elevated for more than one month. Shortly after initiation of therapy, SGOT and SGPT activities fell suddenly, reaching normal values within a few months in all cases. Such a sudden halt in hepatic cytolysis cannot be attributed to azathioprine reaching therapeutic values in the liver and tissues, but rather to the immunosuppressive action of the drug. Azathioprine was tolerated well by all but five of the patients who developed temporary leukopenia. Leukopenia was reversible after discontinuation of the drug.

9108 LIVER FUNCTION AFTER RENAL TRANSPLANTATION. *(E.)* Zazgornik, J.; Schmidt, P.; Kopsa, H.; Deutsch, E. (I. Medizinischen Universitatsklinik Wien, Vienna, Austria). *Med. Chir. Dig.* 4(2):81-84, 1975.

Liver function was studied in 15 patients after renal transplantation to determine whether hepatitis-B antigen (HBAg)-serum-hepatitis is a major cause of deterioration in liver function during regular dialysis treatment (RDT). In all patients, immunosuppressive therapy with prednisolone (100 mg/day up to 6 months, 25 mg/day after 6 months and 21 mg/day after 12 months), azathioprine (2-3 mg/day), and anti-lymphocyte-globulin (30 ml/day for 20 days) was begun immediately following surgery. Liver enzymes, HBAg, and HBAb (hepatitis-B antibody) were measured every month throughout RDT and after renal transplantation. Nine of the patients had HBAg-serum hepatitis during dialysis treatment: three were HBAg positive; one was HBAb positive; and five were HBAg negative at the time of transplantation. HB-antigenemia persisted for 7 to 19 months after renal transplantation in the HBAg positive patients; all had chronic hepatitis. Of the five HBAg negative patients, one developed HB-antigenemia three months after surgery and one became HBAb positive two months after surgery; both patients exhibited pathological liver function during serological recurrence of hepatitis. The other three patients remained HBAg negative although biochemical findings revealed hepatitis some weeks after surgery. Of the six patients with no history of hepatitis during dialysis, two became HBAg positive one to two months after surgery. The other four patients remianed HBAg and HBAb negative, although one showed clinical evidence of hepatitis 12 months after surgery. In all but one patient, bilirubinemia of 2.7 mg/100 ml and serum hepatitis were present. The data indicate that serum hepatitis could be a serious complication and the cause of persistent liver disease during RDT and after renal transplantation. There was no evidence that azathioprine was a causative factor in the development of liver disease in these patients.

9109 EXCHANGE TRANSFUSIONS IN THE TREATMENT OF ACUTE LIVER FAILURE. *(It.)* Naccarato, R.; Gritti, G.; Giunta, F.; Chiaramonte, M.; Valenti, F. (Inst. Medical Pathology, Univ. Padua, Italy). *Minerva Chir.* 29(18):982-988, 1974.

A modification of Abouna's method was used to perform isovolemic exchange transfusions on 16 patients in hepatic coma (stage 2-3). These patients consisted of: (1) seven patients (aged 10 to 63 yr) with viral hepatitis; (2) three infants (aged 4-14 mo) with viral hepatitis; and (3) six children (aged 5-12 yr) all but one of whom had *Amanita phalloides* intoxication. Respiratory failure was present in ten cases, alkalosis in 11, acidosis in four, gastrointestinal bleeding in six, and hypoglycemia in three. Abnormalities in the acid-base balance were treated by adding 5 to 8 mEq of sodium bicarbonate to each unit of blood. The volume of blood exchanged averaged 100 mg/kg; the flow rate was between 50 and 60 ml/min; and the time blood was stored ranged from 24 to 72 hr. Exchange transfusions were performed at 18 to 24 hr intervals as needed. From two to six transfusions were performed on 11 of these 16 patients. Immediately after each exchange transfusion, serum bilirubin concentrations fell to half their initial values and the prothrombin activity increased significantly. This was followed by a marked decrease; however, values which usually result in severe bleeding were not reached. Recoveries occurred in six of the seven patients in group (1); in one of the three patients in group (2), and in only one of the six patients in group (3). Only the oldest of the three infants in group (2) survived. All five patients in group (3) who failed to respond to exchange transfusions died 7 to 8 days after ingestion of the mushrooms without showing any signs of improvement. It is concluded that exchange transfusions are not effective in the treatment of hepatic coma caused by *Amanita phalloides* intoxication.

9110 ORAL CONTRACEPTIVES IN ACUTE VIRAL HEPATITIS. *(E.)* Schweitzer, I. L.; Weiner, J. M.; McPeak, C. M.; Thursby, M. W. (Univ. Southern California Sch. Medicine, Los Angeles, Calif.). *JAMA* 233(9):979-981, 1975.

The effects of oral contraceptives on the course of acute viral hepatitis and/or its sequelae were studied in 34 women who took these drugs during the major part of the acute and convalescent phases of viral hepatitis. Control patients had the disease at the same time and were treated at the same facility but had never taken oral contraceptives. The two groups were similar in terms of age, duration of illness preceding hospital-

ization, length of hospitalization, presence or absence of hepatitis B surface antigen, and maximum laboratory abnormalities. After discharge, the patients were followed up at intervals of 2 wk, 2 months, 5 months, and one yr; they were classified as healed, probably healed, healed with probable carrier state, showing probable persistent hepatitis, showing persistent hepatitis, or showing recurrence. The outcome and sequelae of the acute viral hepatitis did not differ significantly between the oral contraceptive users and controls. The data suggest an absence of any deleterious effects of oral contraceptive agents administered during acute viral hepatitis.

9111 EMPIDEMIOLOGICAL OBSERVATIONS ON THE FAMILIES OF HEPATITIS B ANTIGEN CARRIERS AND HEPATITIS B ANTIBODY-POSITIVE INDIVIDUALS [abstract]. *(E.)* Hellawell, J. M.; Woolf, I. L.; Jones, D. M.; Dymock, I. W. (Univ. Hosp. South Manchester, Manchester, England). *Gut* 16(5):402, 1975.

9112 SERUM IgG LEVELS IN SUBACUTE HEPATIC NECROSIS [abstract]. *(E.)* Dourdourekas, D.; Canlas, N.; Ainis H.; Szanto, P.; Steigmann, F. (Hektoen Institute for Med. Res., Chicago, Ill.). *Gastroenterology* 68(4):1086, 1975.

9113 ALPHA-ANTITRYPSIN AND FULMINANT HEPATITIS [abstract]. *(E.)* Rueff, B.; Morin, T.; Martin, J. P.; Feldmann, G.; Ropartz, C.; Benhamou, J. P. (Hosp. Beaujon, Clichy, France). *Gastroenterology* 68(4):1084, 1975.

9114 NON-A, NON-B HEPATITIS: SEROLOGIC STUDIES OF TWO PATIENTS WITH MULTIPLE EPISODES [abstract]. *(E.)* Mosley, J. W.; Redeker, A. G.; Karvountzis, G. G. (Univ. Southern California, Los Angeles, Calif.). *Gastroenterology* 68(4):1082, 1975.

9115 THE e ANTIGEN AS AN INDEX OF CHRONIC HEPATITIS B VIRUS INFECTION [abstract]. *(E.)* Fay, O.; Edwards, V. M.; Mosley, J. W.; Redeker, A. G. (Univ. Southern California Sch. Med., Los Angeles, Calif.). *Gastroenterology* 68(4):1081, 1975.

9116 FAILURE TO DETECT HEPATITIS B SURFACE ANTIGEN (HB_SAG) IN CERTIFIED SHELLFISH IN NEW ENGLAND [abstract]. *(E.)* Koff, R. S.; Connelly, L. J. D. (VA Hosp., Boston, Mass). *Gastroenterology* 68(4):1079, 1975.

9117 HEPATITIS B CORE AND SURFACE ANTIGENS, IMMUNOGLOBULINS, AND COMPLEMENT LIVER BIOPSIES: DETECTION BY DIRECT IMMUNOFLUORESCENCE [abstract]. *(E.)* Trepo, C.; Schaefer, R. A.; Vitvitski, L.; Prince, A. M. (Dept. Med., Cornell Univ., New York, N.Y.). *Clin. Res.* 23(3):258A, 1975.

9118 INHIBITION OF MACROPHAGE MIGRATION IN RESPONSE TO HEPATITIS B_S ANTIGEN (HB_SAG) [abstract]. *(E.)* Howlett, S. A.; McGuigan, J. E. (Univ. Florida Coll. Med., Gainesville, Fla.). *Gastroenterology* 68(4):951, 1975.

9119 PRELIMINARY REPORT ON HBAg SUBTYPES IN WESTERN SICILY [abstract]. *(E.)* Dardanoni, L.; Filippazzo, G.; La Licata, S.; Pagliaro, L.; Spano, C. (Divisione de Medicina dell'Ospedale, Palermo, Italy). *Rend. Gastroenterol.* 6(3):208-209, 1974.

9120 THE ROLE OF AUTOANTIBODIES IN THE PATHOGENESIS OF VIRAL HEPATITIS IN CHILDREN. *(Rus.)* Nisevish, N. I.; Uchaikin, V. F.; Cheredinchenko, T. V.; Seitnepesov, K. (Dept. Infectious Diseases of Childhood, N. I. Pirogov Second Moscow Medical Inst., Moscow, USSR). *Vopr. Okhr. Materin. Det.* 20(3):3-7, 1975.

9121 TREATMENT OF PATIENTS WITH VIRAL HEPATITIS SUFFERING FROM PULMONARY TUBERCULOSIS. *(Rus.)* Djakdish, P. (Dept. Infectious Diseases, Lvov Medical Inst., Lvov, USSR). *Vrach. Delo* (4):123-126, 1975.

9122 STUDIES ON THE SO-CALLED "STOMATOCYTES" IN THE PERIPHERAL BLOOD OF PATIENTS WITH VIRAL HEPATITIS. *(Pol.)* Boron, P.; Ostaszewska, A.; Borowska, E.; Klonowska, A. (Clinic Infectious Diseases, Medical Acad., Bialystok, Poland). *Pol. Tyg. Lek.* 30(16):665-668, 1975.

9123 CLINICO-LABORATORY CHARACTERISTICS OF THE RESTORATIVE PERIOD OF VIRAL HEPATITIS IN WORKERS OF CHEMICAL ENTERPRISES. *(Rus.)* Mukhordov, F. G.; Krasnov, A. V.; Dokukina, A. G. (Dept. of Infectious Diseases, Kemerovo Medical Inst., USSR). *Ter. Arkh.* 47(2):92-95, 1975.

9124 THERAPY OF PATIENTS WITH SERUM HEPATITIS. *(Rus.)* Ilyinsky, R. A.; Pak, S. G.; Brodov, L. E.; Lychskev, V. I. (Clinical Div., Central Inst. Epidemiology Ministry Public Health USSR, Moscow, USSR). *Vrach. Delo* (4):120-123, 1975.

9125 DETERMINATION OF CERTAIN BLOOD CLOTTING AND FIBRINOLYSIS FACTORS IN PATIENTS WITH VIRUS HEPATITIS. *(Pol.)* Przyemski, J.; Chrostowska, H.; Ellert-Zygadiowska, J.; Krzysztofowicz, J. (Clinic Infectious Diseases, Medical Acad., Gdansk, Poland). *Wiad. Lek.* 28(7):533-542, 1975.

9126 DIAGNOSIS OF THE CHOLANGIOLYTIC FORM OF VIRAL HEPATITIS. *(Rus.)* Bychkova, V. I. (Dept. Infectious Diseases, Dnepropetrovsk Medical Inst., USSR). *Klin. Med. (Mosk.)* 53(2):37-42, 1975.

9127 CLINICO-BIOCHEMICAL AND MORPHOLOGICAL COMPARISONS IN PERSONS WITH LONG-TERM SH-ANTIGENEMIA FOLLOWING VIRAL HEPATITIS. *(Rus.)* Sinaiko, G. A.; Paktoris, E. A.; Braginsky, D. N.; Sergeeva, N. A.; Shumkina, O. B.; Kulchak, S. N. (Clinical Div., D. I. Ivanovskiy Inst. Virology, Moscow, USSR). *Klin. Med. (Mosk.)* 53(1):73-80, 1975.

See also, 8468, 8474, 8913, 8961, 8981, 9141, 9204, 9208, 9278.

LIVER AND BILIARY TRACT

Chronic Hepatitis

9128 PERIARTERITIS NODOSA, LIVER DISEASE, AND PERSISTENT HEPATITIS B ANTIGEN. *(Ger.)* Strohmeyer, G.; Berger, M.; Jacobi, E.; Borchard, F. (II. Medizinische Klinik, Universitat Dusseldorf, Germany). *Z. Gastroenterol.* 13(4):452-456, 1975.

A 68-yr-old man who had a history of recurrent tonsillitis as a child and who was suspected of having polyarthritis and myocarditis was hospitalized with weight loss, dermographia, cyanosis, hepatomegaly, paresis, and abnormal reflexes in the lower extremities. Radiological findings included pulmonary emphysema and a horizontal gallbladder which was located far to the side; no evidence of cholelithiasis was found. Serum transaminase and alkaline phosphatase values were initially within normal limits, but serum hepatitis B antigen titers (determined by radioimmunoassay) were five times higher than normal. Histological examination of a liver biopsy showed chronic persistent hepatitis with moderate steatosis and interlobular fibrosis. A diagnosis of periarteritis was confirmed by a skeletal muscle biopsy. The patient developed refractory diastolic hypertension and high fevers which failed to respond to antibiotics. Prednisone (60 mg/day, in decreasing doses) was administered, but the patient continued to lose weight, developed polyneuritis, and died of chronic circulatory failure. At autopsy, signs of periarteritis were found in the liver, heart, kidneys, and pancreas. Histological examination of the liver revealed moderate- to large-sized fat vacuoles in many liver cells in the center of the lobules. The nuclei of these cells differed in size and many contained two nuclei and large clumps of lipofuscin pigment in their cytoplasm. Glisson's fields were enlarged, moderately scarred, and generally contained thick inflammatory infiltrates. A larger branch of the hepatic artery was obstructed and a smaller one was stenotic with parenchyma which had split off the tunica media. A few liver cells, but not the walls of the blood vessels, stained weakly positive with aldehyde-thione which is said to be a technique for staining hepatitis B antigen. These findings are similar to those from other cases reported in the literature.

9129 GENETIC ANALYSIS OF PATIENTS WITH CHRONIC ACTIVE HEPATITIS. *(E.)* Page, A. R.; Sharp, H. L.; Greenberg, L. J.; Yunis, E. J. (Univ. Minnesota Medical Sch., Minneapolis, Minn. 55455). *J. Clin. Invest.* 56(3):530-535, 1975.

HL-A genotyping was performed in 17 female and four male chronic active hepatitis patients, and the frequency of the HL-A8-associated mixed lymphocyte culture (MLC) determinant 8a was determined among patients and controls matched for HL-A types. Most of the patients responded favorably to prednisone and/or 6-mercaptopurine therapy. HL-A antigens were determined using a standard two-stage dye exclusion microcytotoxicity test, and unidirectional mixed culture reactivity was determined by a microculture technique. Both HL-A1 and HL-A8 were significantly increased in the patient group compared with the controls; the increased frequency of the former was secondary to the increased HL-A8 due to linkage disequilibrium. Genotype analysis also revealed a striking increase in HL-A8 homozygosity in the patients (28.5%) as compared with the controls (2.8%). Two of the patients and one control, who were homozygous for both HL-A8 and HL-A1, were homozygous for MLC determinant 8a. This determinant was carried by 5 of 7 HL-A8 homozygous controls, 2 of 5 HL-A8 homozygous patients, 8 of 15 HL-A8 heterozygous controls, 3 of 5 HL-A8 heterozygous patients, none of 27 HL-A8-negative controls, and 1 of 7 HL-A8-negative patients. The proportion of patients and controls carrying 8a was the same when the two groups were matched for HL-A typing. The data suggest that susceptibility to chronic active hepatitis is determined by homozygosity for a gene that is in linkage disequilibrium with HL-A8 and more closely associated with the HL-A second locus than with the locus for the major MLC determinant.

9130 IMMUNOLOGICAL AND BIOHUMORAL FEATURES OF CHRONIC AGGRESSIVE HEPATITIS: CHANGES RELATED TO THE PRESENCE OF HEPATITIS B ANTIGEN (HBAg). *(It.)* Ascione, A.; Claar, G. M.; Oriani, G. A. (Ospedali Riuniti Napoli, Italy). *Gazz. Sanit.* 45(6/7):154-157, 1974.

Direct bilirubin, SGOT, SGPT, γ-glutamyl transaminase (γ-GT), pseudocholinesterase (PCH), and immunoglobulin fractions were determined on serum samples from 27 patients with chronic aggressive hepatitis confirmed by hepatic biopsy according to the criteria proposed by De Groote *et al.* HBAg was determined by electrosyneresis. Of these 27 patients, 13

(48.1%) were HBAg-positive (median age 28 yr) and 14 were HBAg-negative (median age 30 yr). No significant differences between these two groups were found for mean direct bilirubin, SGOT, SGPT, γ-GT, or PCH values. While mean immunoglobulin levels were higher in HBAg-negative patients, only the mean IgM concentration was significantly higher than in HBAg-positive patients. Studies of correlations between the various parameters showed a significant inverse correlation between SGOT activities and IgA concentrations in HBAg-negative but not in HBAg-positive patients. This correlation confirms the clinical impression that HBAg-negative patients with chronic aggressive hepatitis more often develop cirrhosis. A direct correlation was found between SGPT and PCH values in HBAg-positive but not in HBAg-negative patients. Although no definite conclusions can be drawn from this correlation, it is hypothesized that this type of relation indicates a tendency for SGPT to decrease as protein synthesis decreases. It is concluded that HBAg-positive and HBAg-negative patients with chronic aggressive hepatitis suffer from the same disease although the prognosis may differ due to differences in immune response which are related to genetic and geographical factors.

9131 RESULTS OF IMMUNOSUPPRESSIVE TREATMENT: PROGNOSIS IN CHRONIC ACTIVE HEPATITIS. *(E.)* Pelikan, V.; Seidlova, V.; Sanova, J.; Komenda, S. (No affiliation given). *Acta Hepato-Gastroenterol.* 22(4):210-214, 1975.

The efficacy of immunosuppressive therapy in chronic active hepatitis was studied in 21 patients followed for 7 yr. In most cases, previous corticosteroid therapy had been discontinued because of side-effects or lack of response. Immunosuppressive therapy consisted of a combination of prednisone (10-15 mg) or triamcinolone (4-8 mg) with 6-mercatopurin (75-100 mg). Of these 21 patients, 4 already had cirrhosis; none were known alcoholics or chronic users of hepatotoxic drugs. Within 6 yr after institution of immunosuppressive therapy, 4 patients had died, 3 of them of liver disease and 1 of lung cancer. In 3 patients, the treatment was discontinued after 1 yr or longer with no subsequent exacerbations, but in 13 patients treatment had to be continued even if the subjective condition and biochemical findings indicated that the disease was stabilized. Among the latter 13 patients, 2 developed cirrhosis and 3 developed portal hypertension with varices and collateral circulation during treatment. Immunosuppressive therapy was associated with decreased transaminase (from 12.15 to 2.68 mM) and γ-globulin (from 2.57 to 1.85 g/100 ml) values and with decreased infiltration of the portal and periportal areas. However, fibrotic changes were more pronounced after therapy than before. The WBC and platelet count remained above the lower normal limit, circulating antibodies against liver cells and bile duct cells were found in 80% of the patients, and 8 patients remained positive for hepatitis B antigen throughout treatment. Immunosuppressive drugs did not have to be discontinued because of side effects in these 13 patients. Mathematical estimates suggest that the probably survival of the 21 patients in this series will be 5.5 to 6.5 yr. The data tend to support the view that immunosuppressive therapy has a beneficial effect on the clinical activity and prognosis of chronic active hepatitis.

9132 PROTHROMBIN COMPLEX CONCENTRATE: USE IN CONTROLLING THE HEMORRHAGIC DIATHESIS OF CHRONIC LIVER DISEASE. *(E.)* Bick, R. L.; Schmalhorst, W. R.; Shanbrom, E. (Sch. Medicine, Univ. California, Los Angeles, Calif.). *Am. J. Dig. Dis.* 20(8):741-749, 1975.

Clinical course and coagulation changes were studied in four patients (two men and two women, aged 22-61 yr) with chronic liver disease. A prothrombin complex concentrate was infused in an attempt to control life-threatening gastrointestinal bleeding and systemic bleeding. In all patients, the initial prothrombin time and quantitative factor II levels were between 10% and 30%, and all had failed to cease bleeding with conventional supportive measures. The amount of prothrombin complex concentrate infused was that calculated to be necessary to raise the factor II level to about 100% of normal. The Quick prothrombin time became normal after one hr of infusion and remained normal only during infusion, a total of three hr; prothrombin time returned to initial levels after two days. Factor II activity approached normal levels about two hr after beginning the infusion and three patients showed an unexplained spontaneous increase in factor II activity 48 hr after cessation of the infusion. Factor IX activity also increased steadily during the infusion but then fell steadily after it was discontinued. Factors VII and X rose steadily during the infusion but fell more sharply afterward. Factors V and VIII increased moderately during the infusion, the former falling immediately after stopping the infusion and the latter falling more slowly. Factors VIII and IX showed spontaneous increases in three patients 48 hr after the cessation of infusion. The half lives of factors II, IX, VII, X, and VIII were 18 hr, 14 hr, 7 hr, 7 hr, and 5 hr, resp. The data indicate that the use of a prothrombin complex concentrate may be a relatively safe and potentially efficacious modality for controlling life-threatening hemorrhage associated with decreased prothrombin complex factors in chronic liver disease. The use of such a complex should be limited to those patients who have a demonstrable decrease in factors II, VII, IX, and/or X and who are to undergo corrective surgery for bleeding once hemostasis is achieved. It should be used in conjunction with other modalities needed to correct all demonstrable hemostatic defects.

9133 PROGNOSTIC EXPERIENCE IN LONG-TERM DIFFERENTIAL THERAPY OF CHRONIC AGGRESSIVE HEPATITIS. *(Ger.)* Sensing, H.; Vollmar, F. (Medizinische Akademie, DDR-50 Erfurt, Nordhauser Strasse 74, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(5/6):293-298, 1974.

A diagnosis of chronic aggressive hepatitis with no evidence of cirrhosis was established by biopsy and/or laparoscopy in 44 patients (19 females and

25 males, aged 12-64 yr; mean age 41.4 yr). Prednisolone (10 mg/day) was administered to 19 of these patients (14 women and 5 men, aged 12-63 yr; mean age 37.8 yr) for 2 yr, and 6-mercaptopurine (6-MP) (50 mg/day) was used to treat the remaining patients (5 women and 20 men, aged 21-64; mean age 44.1 yr). Liver function tests (serum color value, thymol turbidity test, serum electrophoresis, SGOT, SGPT, iron alkaline phosphatase, and BSP) were performed before and after treatment, and biopsies and/or laparoscopies were repeated on all patients; six other patients given prednisolone refused biopsy and could not be included in the results. Liver function tests showed no appreciable differences between results obtained with prednisolone and those obtained with 6-MP, but histological improvement occurred in 84.2% of those in the prednisolone group and in only 56.0% of those given 6-MP. Histological findings normalized completely in one patient given prednisolone. After treatment, chronic persistent hepatitis was diagnosed histologically in 21.1% of prednisolone-treated patients and in 16.0% of those given 6-MP, while chronic aggressive hepatitis persisted in five (26.3%) of the prednisolone group and in 13 (52%) of those given 6-MP. Degenerative parenchymal damage was more common in the prednisolone group (42.1%) than in patients treated with 6-MP (20.0%), and histological findings became worse in 5.3% of the prednisolone group and 12.0% of patients receiving 6-MP. Manifest symptoms of portal hypertension occurred only in patients given 6-MP who developed cirrhosis. Statistical analysis with the X^2 test showed that histological differences between these two groups of patients were not significant.

9134 IMMUNOLOGICALLY COMPETENT CELLS IN HBAg POSITIVE AND NEGATIVE CHRONIC ACTIVE HEPATITIS [abstract]. *(E.)* Kawanishi, H.; Brown, G. C.; O'Leary, T. O. (VA Hosp., Ann Arbor, Mich.). *Gastroenterology* 68(4):923, 1975.

9135 CHRONIC ACTIVE LIVER DISEASE (CALD) IN ASSOCIATION WITH CHRONIC ALCOHOLISM (CA) [abstract]. *(E.)* Goldberg, S.; Mendenhall, C. L.; Connell, A. (Univ. Cincinnati Coll. of Medicine, Cincinnati, Ohio). *Gastroenterology* 68(4):1080, 1975.

9136 CHRONIC ACTIVE HEPATITIS AND ETHANOL—A FORM OF DRUG HEPATITIS [abstract]. *(E.)* Galambos, J. T. (Emory Univ. Sch. Med., Atlanta, Ga.). *Gastroenterology* 68(4):1075, 1975.

9137 CYTOTOXICITY OF AUTOLOGOUS AND NORMAL LYMPHOCYTES AGAINST ISOLATED LIVER CELLS FROM PATIENTS WITH CHRONIC ACTIVE LIVER DISEASE (CALD) [abstract]. *(E.)* Geubel, A. P.; Keller, R. H.; Summerskill, W. H. J.; Stobok, J. D.; Tomasi, T. B.; Shorter, R. G. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 68(4):1084, 1975.

9138 THE VALUE OF BIOCHEMICAL STUDIES IN THE DIAGNOSIS OF CHRONIC ACTIVE HEPATITIS (CAH) OF VARIOUS ETIOLOGIES [abstract]. *(E.)* Nowak, T. V.; Parker, H. W.; Varma, R. R. (Med. Coll. of Wisconsin, Milwaukee, Wis.). *Gastroenterology* 68(4):1087, 1975.

See also, 8971, 9026, 9118, 9184, 9199, 9206, 9210, 9211.

LIVER AND BILIARY TRACT

Alcoholic Liver Disease

9139 CASUAL BLOOD-ETHANOL ESTIMATIONS IN PATIENTS WITH CHRONIC LIVER DISEASE. *(E.)* Hamlyn, A. N.; Sherlock, S.; Brown, A. J.; Baron, D. N. (Royal Victoria Infirmary, Newcastle upon Tyne, England). *Lancet* 2(7930):345-347, 1975.

Blood-ethanol levels in 172 outpatients with alcoholic, cryptogenic, and other liver diseases were assessed and evaluated. An unselected sample of outpatients was questioned as to drinking habits. The blood-alcohol content of specimens drawn from a peripheral vein was estimated by gas chromatography, followed by liver biopsy when necessary. Of the 172 patients tested, 36% admitted drinking more than 80 g of ethanol/day; 13% had ethanol detectable in their blood. While ethanol was not detected in any of the 95 patients with non-alcoholic or non-cryptogenic cirrhotic liver disease, 41% of those with alcoholic liver disease had ethanol in the blood. The most constant detection of blood-ethanol occurred in those with alcoholic hepatitis or alcoholic steatosis; 65% of those had blood-ethanol. Forty-five percent of all patients admitting to heavy drinking had ethanol in the blood at one time or another, although it was found that the patients generally underestimated their intake. Likewise, no patient with a positive blood-ethanol level had a normal liver biopsy. When detected, the distribution of blood-ethanol levels corresponded to a log-normal curve with a mode at 28 ml/dl and noted a significant excess of women with higher blood-alcohol levels. While a history of heavy drinking was more constantly associated with alcoholic liver disease than was the finding of blood-ethanol, the

blood test was considered a useful confirmation of clinical suspicion. The results indicated that a history of heavy drinking and positive blood-ethanol were not greatly associated with cryptogenic liver disease, but rather with alcoholic liver damage. It is also suggested that serial blood-ethanol estimations are valuable in the treatment of alcoholics and the detection of relapses.

9140 FATTY ACID PATTERN IN HUMAN FAT AND LIVER TISSUE IN NONALCOHOLICS AND ALCOHOLICS. *(Ger.)* Berghaus, G.; Kurz, A.; Dotzauer, G. (Institut Gerichtliche Medizin, Universitat Koln, 5 Koln 30, Melatengurtel 60-62, Germany). *Dtsch. Med. Wochenschr.* 100(22):1233-1238, 1975.

After hydrolysis with sodium methylate, free fatty acids were determined quantitatively by gas-liquid chromatography in samples of subcutaneous fat and liver from 116 subjects (78 males and 38 females) who were autopsied after dying suddenly. Of these 116 subjects, 56 died of natural causes, 26 committed suicide, five were murdered, and 21 died in accidents. Since little information on the alcohol comsumption of these subjects was available, only 19 subjects known to the police as drinkers and/or those who had undergone one or more courses of withdrawal were classified as alcoholics. Comparisons were also made between the extent of fatty infiltration in livers from alcoholics and nonalcoholics. Calculation of Spearmann's correlation coefficients to analyze the relation between the extent of fatty infiltration and the fatty acid pattern showed that as the extent of fatty infiltration increased, so did the relative amount of palmitoleic acid in the liver and subcutaneous fat with decreases occurring in the relative proportion of stearic acid in subcutaneous fat. The mean content of total esterified fatty acids was 13.44% in the livers of alcoholics and only 5.62% in those of nonalcoholics; this difference is significant. A comparison of the fatty acid patterns of alcoholics and nonalcoholics demonstrated that the relative proportion of palmitoleic acid was significantly higher in the subcutaneous fat of alcoholics than in that of nonalcoholics. In alcoholics, the proportion of palmitoleic acid was higher in the liver than in subcutaneous fat, while in nonalcoholics the reverse was true. Studies are now in progress to study the relation of the fatty acid pattern of serum triglycerides, free fatty acids, and blood alcohol levels.

9141 REDUCED PERIPHERAL CONVERSION OF THYROXINE TO TRIIODOTHYRONINE IN PATIENTS WITH HEPATIC CIRRHOSIS. *(E.)* Nomura, S.; Pittman, C. S.; Chambers, J. B.; Buck, M. W.; Shimizu, T. (Veterans Admin. Hosp., Birmingham, Ala. 35233). *J. Clin. Invest.* 56(3):643-652, 1975.

The role of the liver in the peripheral conversion of thyroxine (T_4) to triiodothyronine (T_3) was studied in normal subjects and patients with alcoholic liver disease by measuring thyrotrophin (TSH) and total and free T_4 and T_3 in random and serial serum samples. Also, T_4 to T_3 conversion rates and T_3 disposal rates were compared by noncompartmental analysis. While the mean total serum T_4 values were similar for the two groups of subjects, the mean free T_4 value was significantly higher in the cirrhotic patients (3.3 ng/dl) than in the normal subjects (2.1 ng/dl). The mean serum T_3 value was significantly reduced in the cirrhotic patients (85 ng/dl) as compared with the normal subjects (126 ng/dl), although the free T_3 value was 0.28 ng/dl in both groups. The reduction in the serum total and free T_3 values was closely correlated with the degree of liver damage, as indicated by elevations in serum bilirubin and reductions in serum albumin. The mean serum TSH level was 3.1 µU/ml in the normal subjects and 7.1 µU/ml in the cirrhotic patients. Fifteen percent of the cirrhotic patients had serum TSH values greater than 10 µU/ml, but these values did not correlate with any of four liver function tests. Serial blood samples from two convalescing patients with alcoholic hepatitis showed a gradual normalization of the serum TSH and T_3 levels as the liver function improved. However, the serum T_3 values in 3 of 4 cirrhotic subjects showed no rise following p.o. T_4 administration (0.25 mg/day for 10 days). The mean T_4 to T_3 conconversion rate in seven normal subjects was 35.7%, the mean conversion rate in the four cirrhotic subjects being significantly reduced to 15.6%. The mean disposal rates of T_4 and T_3 in the normal subjects were 114 and 34 µg/day, resp., and the ratio of T_4 disposal to T_3 disposal was 3.5. In contrast, the mean T_4 and T_3 disposal rates (82 µg/day, and 10 µg/day, resp.) in the cirrhotic subjects were reduced and the ratio of T_4 disposal to T_3 disposal in these subjects was 7.9. The data suggest that impairment of T_4 conversion in patients with advanced hepatic cirrhosis may lead to reduced T_3 production and lowered serum T_3 concentrations. Thus, the liver appears to be one of the major sites of T_4 conversion to T_3.

9142 THE INFLUENCE OF PORTAL PERFUSION ON THE RESPONSE TO PORTACAVAL SHUNT. *(E.)* Charters, III, A. C.; Brown, B. N.; Sviolka, S. C.; Knox, D. G.; Orloff, M. J. (Sch. Medicine, Univ. California, San Diego, La Jolla, Calif.). *Am. J. Surg.* 130(2):226-232, 1975.

Detailed intraoperative pressure measurements were made in 138 unselected patients with alcoholic cirrhosis who underwent emergency portacaval shunt procedures for bleeding esophageal varices. The relations between maximum perfusion in the portal vein and postoperative survival, hepatic function and encephalopathy were examined. Pressures in the portal vein and inferior vena cava were measured with a saline manometer by direct needle puncture before and after the shunt procedure. Maximum perfusion pressure was determined by subtracting the hepatic occluded portal pressure from the splanchnic occluded portal pressure. Side-to-side portacaval shunt was used in 106 patients, end-to-side shunt in 29 patients, and another type of anastomosis in the remaining three patients. There was no correlation between maximum perfusion pressure and postshunt survival, presence and volume of ascites, liver

function, hepatic failure or the development of protein-related encephalopathy. Patients with the lowest preshunt maximum perfusion pressure (≤ 100 mm saline) had the lowest survival rate (44%) and a high incidence of encephalopathy in the survivors (18%). Patients with the highest preshunt maximum perfusion pressure (>300 mm saline) had the highest survival rate (70%) and the lowest incidence of encephalopathy (8%). These results are contrary to the hypothesis that the magnitude of portal diversion and the results of portacaval shunt procedures can be predicted from the maximum shunt pressures.

9143 ^{14}C-ETHANOL BREATH TEST IN ALCOHOLIC LIVER DISEASE [abstract]. *(E.)* Dordoni, B.; Thompson, R. P. H.; Williams, R. (King's Coll. Hosp., London, England). *Gut* 16(5):400, 1975.

9144 LYMPHOCYTE CYTOTOXICITY TO ISOLATED HEPATOCYTES IN ALCOHOLIC LIVER DISEASE [abstract]. *(E.)* Cochrane, A. M. G.; Thomson, A. D.; Moussouros, A.; Portman, B.; Eddleston, A. L. W. F.; Williams, R. (King's Coll. Hosp., London, England). *Gut* 16(5):400, 1975.

9145 EPIDEMIOLOGY OF ALCOHOLIC CIRRHOSIS: INFLUENCE OF ETHNIC ORIGIN [abstract]. *(E.)* Shurberg, J. L.; Resnick, R. H.; Weinberg, G. M. (Tufts Univ. Sch. Med., Boston, Mass.). *Gastroenterology* 68(4):986, 1975.

9146 INTRADUODENAL CONCENTRATION OF BILE SALTS AND PANCREATIC FUNCTION IN PATIENTS WITH ALCOHOLIC LIVER DISEASE AND STEATORRHEA [abstract]. *(E.)* Gourgoutis, G. D. (VA Cent., Dayton, Ohio). *Gastroenterology* 68(4):902, 1975.

9147 DEOXYCHOLIC ACID (DC) METABOLISM IN PATIENTS WITH ALCOHOLIC CIRRHOSIS [abstract]. *(E.)* Knodell, R. G.; Kinsey, M. D.; Boedeker, E. C. (Walter Reed Army Inst. of Research, Washington, D.C.). *Clin. Res.* 23(3):252A, 1975.

9148 PLASMA AMINO ACIDS IN ALCOHOLIC LIVER INJURY: CONTRAST WITH PROTEIN MALNUTRITION [abstract]. *(E.)* Shaw, S.; Lieber, C. S. (Bronx VA Hosp., Bronx, N. Y.). *Clin. Res.* 23(3):459A, 1975.

9149 MORPHOLOGICAL CHANGES IN THE LIVER INDUCED BY ALCOHOL. III: CIRRHOSIS. *(Dan.)* Christoffersen, A. P. (Pathoanatomical Inst., Copenhagen Communal Hosp., Denmark). *Ugeskr. Laeger* 137(15): 851-853, 1975.

9150 STUDY AND INTEREST OF IMMUNOGLOBULIN A AND TRANSFERRIN LEVELS DETERMINATION IN ALCOHOLIC/CIRRHOSIS. *(Fr.)* Riou, J. P.; Bertrand, J. L.; Brette, R. (Hopital Debrousse, F 69322, Lyon Cedex 1, France). *Lyon Med.* 232(19):627-634, 1974.

9151 LIPID SPECTRUM OF THE BLOOD AND SOME INDICES OF THE LIVER FUNCTION IN CHRONIC ALCOHOLISM (REPORT 1). *(Rus.)* Bondar, Z. A.; Starovoitova, S. P.; Ivanets, N. N.; Makhov, V. M.; Polunina, G. N. (Faculty Clinic of Therapy, I. M. Sechenov First Moscow Medical Institute, USSR). *Ter. Arkh.* 47(2):95-100, 1975.

9152 MICROSOMAL ELECTRON TRANSPORT IN HUMAN HEPATIC MEMBRANES: INHIBITION OF REDUCTASES IN MICROSOMES FROM FATTY LIVER. *(E.)* Ozols, J. (UCONN Health Cent., Farmington, Conn.). *Fed. Proc.* 34(3):622, 1975.

9153 HEMODYNAMIC EFFECTS OF CALCIUM INFUSION IN PATIENTS WITH HYPERTENSION AND ALCOHOLIC LIVER DISEASE. *(E.)* Vlahakis, N.; Viau, A. T.; Wertheimer, L.; Naftchi, N. E. (N.Y.U. Med. Cent., New York, N.Y.). *Fed. Proc.* 34(3):368, 1975.

9154 AN IN VITRO APPROACH TO ALCOHOLIC LIVER DISEASE: INHIBITION OF TISSUE TO CULTURE CELL GROWTH BY LOW CONCENTRATIONS OF ETHANOL [abstract]. *(E.)* Miller, Jr., J. V. (UNM Med. Sch., Albuquerque, N.M.). *Clin. Res.* 23(3):253A, 1975.

9155 HEPATOMA AND ALCOHOLIC CIRRHOSIS [abstract]. *(E.)* Wilen, S. B. (SUNY-Downstate Medical Center, Brooklyn, N.Y.). *Clin. Res.* 23(3):344A, 1975.

9156 IMPAIRED UTILIZATION BY CHRONIC ALCOHOLICS OF YEAST AS A SOURCE OF FOLATES [abstract]. *(E.)* Frank, O.; Zetterman, R.; Raian, K. S.; Baker, H. (New Jersey Med. Sch., Newark, N.J.). *Clin. Res.* 23(3):458A, 1975.

9157 CONSUMPTION OF ALCOHOLIC BEVERAGES: BIOCHEMICAL AND NUTRITION-PHYSIOLOGICAL ASPECTS. *(Ger.)* Pietrzik, K.; Hotzel, D.; Sultemeier, J. (Inst. Fur Ernahrungswissenschaft, Rheinische Friedrich-Wilhems-Univ., 53 Bonn, Germany). *Dtsch. Lebensm. Rundsch.* 71(4):132-137, 1975.

9158 BODY ELECTROLYTE AND WATER COMPOSITION IN LIVER, MUSCLE, AND WHOLE BODY IN HUMAN ALCOHOLIC CIRRHOSIS [abstract]. *(E.)* Pierson, Jr., R. N.; Wang, J. (St. Luke's Hosp., New York, N.Y.). *Clin. Res.* 23(3):254A, 1975.

See also, 9132, 9136, 9182.

Cirrhosis

9159 HISTOLOGICAL-VENOGRAPHIC CORRELATES IN PORTAL HYPERTENSION. *(E.)* Bookstein, J. J.; Appelman, H. D.; Walter, J. F.; Foley, W. D., Turcotte, J. G.; Lambert, M. (Univ. Michigan Med. Cent., Ann Arbor). *Radiology* 116(3):565-573, 1975.

The morphological, physiological, and histographic features of portal hypertension were studied in 40 affected patients and 6 normal subjects using hepatic wedge venography, manometry, celiac and superior mesenteric arteriography, and endoscopy and/or barium esophagography. Biopsy material was available from 32 of the patients. Venography and manometry revealed stenosis and occlusion of the hepatic veins in 16/26 (62%) of the cirrhotic patients, most of whom also showed a sparse, uneven pattern of arborization. In a few cases a peculiar hairy pattern was observed which probably results from reticulin collapse. All cirrhotic patients had an abnormal parenchymogram which showed alternating areas of parenchyma and scarring corresponding to micronodular, intermediate, and macronodular cirrhosis. Parenchymograms were nearly normal in the patients with periportal fibrosis, while the patients with congenital hepatic fibrosis exhibited a regular pattern of lobule-sized densities. No parenchymal pattern developed in patients with Budd-Chiari syndrome or α_1-antitrypsin deficiency. The portal veins were visualized in all of the normal patients, 83% of those with cirrhosis, 75% of those with periportal fibrosis, and none of those with congenital hepatic fibrosis. Wedge pressures were elevated in 25/28 (90%) of the cirrhotic patients and in the patient with Budd-Chiari disease. Among the cirrhotic patients, no angiographic feature appeared to be of significant value in differentiating one cause from another. Apart from the fact that no patient with a normal wedge pressure had hepatic venous stenosis or occlusion, no consistent trend was observed. However, a macrolobular venographic pattern was always associated with intermediate or macronodular cirrhosis, while a lobular venographic pattern was associated with periportal fibrosis or congenital hepatic fibrosis more frequently than with cirrhosis. Thus, magnification hepatic wedge venography and manometry proved to be reasonably precise in evaluating hepatic morphology and hemodynamics in patients with portal hypertension.

9160 A NEW CASE OF HEAVY μ-CHAIN DISEASE. *(E.)* Danon, F.; Mihaesco, C.; Bouvry, M.; Clerc, M.; Seligmann, M. (Res. Inst. on Blood Diseases of the Univ. of Paris VII, Hopital Saint-Louis, Paris 10, France). *Scand. J. Haematol.* 15(1):5-9, 1975.

A new case of μ heavy chain disease (μCD) occurring in a patient living in Ivory Coast is described. A 58-yr-old Negro man had a history of abdominal distension, syphilis, onchocercosis, splenomegaly, and hematemesis. He presented with ascites, a large firm smooth spleen, portal hypertension, high splenic pressure (40 cm H_2O), and esophageal varices. Needle biopsy confirmed cryptogenic nodular cirrhosis. The patient also had gallstones, and immunofluorescence positivity for several parasitic antibodies. Serum proteins amounted to 8.2 g%. The amount of abnormal protein in the serum was great enough to give an abnormal band on routine electrophoresis. The protein was devoid of light chains and contained all the antigenic determinants found in the papain and trypsin pentameric Fc fragments. The molecular weight of the reduced and alkylated monomer of the μCD protein estimated in sodium dodecylsulfate polyacrylamide gel electrophoresis was 55,000-60,000. The corrected sedimentation coefficient was 11.9S; Cys peptides involved in three inter μchain disulphide bonds of the IgM molecules were demonstrated. Immunoelectrophoretic analysis of concentrated urine proteins showed no Bence-Jones protein and only traces of the IgM reactive component. The data suggest that the entire Fc portion, the hinge peptide, and part of the constant and variable regions of the Fd segment are present in the protein.

9161 INTRAVASCULAR COAGULATION IN CIRRHOSIS. *(Fr.)* Boureille, J.; Hayet, M.; Joram, F.; Bentot, G. (Hôpital Charles-Nicolle, 1 rue de Germont, C.H.U., F. 76038 Rouen, France). *Nouv. Presse Med.* 4(17):1267-1270, 1975.

Disseminated intravascular coagulation (DIC) was investigated in six patients in a group of 31 hospitalized cirrhotics; the six were chosen on the basis of 18 coagulation tests. Five cases were found to be serious decompensated cirrhotics with hepatic insufficiency; the sixth case was a cirrhotic treated by portacaval anastomosis. The diagnosis of DIC was difficult in cirrhotics for many reasons such as: deficit of hepatic coagulating factors, an increase of plasma volume, numerous hemorrhages requiring transfusion, thrombocytopenia and the possibilify of hyperfibrigenemia. The main features of DIC were decreases in fibrinogen, decreases in platelet count and also in differential factors of coagulation (especially proaccelerine). In three cases, none of these factors seemed to be the direct cause of DIC, which was related instead to use of diethylstilbestrol, two occurrences of streptoccal infection and a gastric cancer. In only two cases could the cirrhosis be linked to the DIC. The primary characteristic of DIC was release of thromboplastic substances into the blood. After this stage, three phases could be distinquished: (1) hypercoagulability with no clinical signs, (2) a secondary coagulation phase presenting with hemorrhages and thrombi, and (3) reactional fibrinolysis, in which the hemorrhagic syndrome worsened. In explanation of this syndrome, three hypotheses were offered: (1) that endothelial cells could release thromboplastic material, (2) hepatocellular lysis could increase during development of the disease, and (3) that thromboplastic hyperactivity could have an erythrocytic origin. In addition, other thrombogenic factors specific to cirrhotics predispose to DIC, such as: local hypercoagulability, increased hematocrit, and blood hyperviscosity, as well as consequences of hepatic insufficiency and portacaval anastomosis.

9162 ALDOLASE ISOENZYMES IN LIVER CIRRHOSIS AND PRIMARY LIVER CELL CANCER. *(E.)* Lehmann, F. G.; Kornacher, J. (Univ. Marburg/Lahn, Marburg, Germany). *Digestion* 12(2):118-122, 1975.

Aldolase isoenzyme patterns were studied in liver cirrhosis and in primary liver cell cancer. The potential diagnostic significance of these patterns was also evaluated. Aldolase activity was assayed *via* immunotitration and immunoprecipitation; sheep antisera to human aldolase subunit A, B, and C and tissue extracts containing 5 to 10 mU of total aldolase activity were employed. In four autopsy specimens of normal livers, the mean values for aldolase A, B, and C were 5.0 ± 0.1 mU/mg, 90 ± 11 mU/mg, and 10.0 ± 0.1 mU/mg, resp. Studies of liver samples in congestive heart failure, fatty degeneration, fibrosis, cirrhosis, and primary liver cell carcinoma showed a predominance of aldolase B in all sections of benign liver diseases. The concentration of aldolase C was additionally elevated in cirrhotic tissues. Aldolase A was the main isoenzyme in the sera of 20 normal individuals, 52 patients with liver cirrhosis, and 22 patients with primary liver cell cancer. Aldolase C activities were all in the same range in the three groups. Aldolase B activities were slightly increased in 19.2% of cirrhosis patients and strongly increased in 18.2% of liver cell carcinomas. These significant variations in aldolase isoenzyme concentrations noted indicate that immunotitration is a suitable method for the differentiation of the isoenzymes in liver tissues and sera. While the shift from aldolase B to A in primary liver cell carcinoma was confirmed, the aldolase A increase was not reflected in the sera and was not found to be hepatoma-specific.

9163 IMMUNOHISTOCHEMICAL CHARACTERIZATION OF COLLAGEN IN CIRRHOSIS. *(Ger.)* Remberger, K.; Gay, S.; Fietzek, P. P. (Pathologisches Institut, Universitat, D-8000 Munchen 15, Thalkirchner Str. 36, Germany). *Virchows Arch.* [*Pathol. Anat.*] 367(3):231-240, 1975.

Collagen was stained by the indirect immunofluorescence technique in liver slices obtained at autopsy from 21 patients with cirrhosis (16 men and 6 women, aged 26-79 yr; mean age 55.5 yr). Cirrhosis was caused by alcoholism (11 cases), chronic hepatic dystrophy (2 cases), and by chronic aggressive hepatitis, chronic cholangitis, and Thorotrast (1 case each). In five cases the cause of the cirrhosis could not be established histologically or through the patient's history. Cirrhosis was associated with primary liver cancer in four cases (2 hepatocellular carcinomas, 1 mixed cell carcinoma, and 1 cholangiocarcinoma). The patient with Thorotrast-induced cirrhosis had a hemangiosarcoma. Controls consisted of young accident victims and patients with hepatic dystrophy caused by congestive heart failure and veno-occlusive disease. While narrow bands of type III collagen were found along the hepatocyte trabeculae and sinusoid endothelium and in the walls of central veins in the normal liver, no type II collagen was found at all and type I was detected only in the walls of large blood vessels. The findings were similar in the cirrhotic liver: type III collagen deposits were increased in the dilated portal fields, connective tissue septa, and regenerating nodules, but type I was present only in the walls of large arteries and type II was not detected at all. There was no difference in collagen distribution in the various types of cirrhosis. Connective tissue in the cholangiocarcinoma and hemangiosarcoma gave a positive reaction for type III collagen, but in hepatocellular carcinomas type III collagen was present only in narrow areas and not all cell trabeculae in the hepatoma nodes were surrounded by type III collagen fibrils. These results confirm the results of previous biochemical studies in which 40% of the total collagen content was identified as type III. Electron microscope investigations have demonstrated that collagen in cirrhotic livers which cannot be identified as type III is present as segment long-spacing crystallites similar to type I. However, since the chromatographic behavior of this collagen and its immunohistochemical and serological reactions differ from those of type I collagen, it is apparently a new, possibly pathological type of collagen which has not previously been described.

9164 IMMUNE COMPLEX TYPE GLOMERULONEPHRITIS IN CIRRHOSIS OF THE LIVER. *(E.)* Callard, P.; Feldman, G.; Prandi, D.; Belair, M. F.; Mandet, C.; Weiss, Y.; Druet, P.; Benhamou, J. P.; Bariety, J. (Hop. Broussais, Paris, France). *Am. J. Pathol.* 80(2):329-340, 1975.

Kidney biopsy specimens from 10 patients with histologically proven cirrhosis and portal hypertension and 10 controls with normal livers and no evidence of renal disease were examined by light, electron, and immunofluorescence microscopy. In addition, determinations of urinary protein, Addis count, serum creatinine, blood urea, blood glucose, serum cryoglobulin, serum hepatitis B surface antigen (HBsAg), and serum IgG, IgA, and IgM were performed. Marked glomerulosclerosis was found in 6 of the cirrhotic patients and a milder form in 3 others. The glomerular lesions were characterized by: thickening of the basement-membrane-like material; electron-dense deposits in the mesangial areas and in the capillary walls; round areas of rarefaction in the membrane-like material and in some deposits; and the presence of IgA, often associated with other immunoglobulins and the C_3 component of complement in the deposits. None of the patients had proteinuria, renal insufficiency, or arterial hypertension, and only 1 patient each had microscopic hematuria and serum HB_sAg. Serum C3 levels were low in 3 patients, serum IgA was elevated in 7 patients, serum IgG was increased in 5 patients, serum IgM was normal, and a cryoglobulin was detected in 4 patients. Four of the control subjects also had glomerulosclerosis, but immunofluorescence was negative in most subjects and the results of all laboratory investigations were normal. Glomerulonephritis in patients with cirrhosis of the liver may result from precipitation of either aggregated immunoglobulins or circulating immune complexes in the glomeruli.

9165 URINARY KALLIKREIN EXCRETION IN CIRRHOSIS. *(It.)* Greco, A. V.; Porcelli, G.; Ghirlanda, G.; Altomonte, L.; Croxatto, H. (Universita Cattolica S. Cuore, Istituto Pathologia Speciale Medica, Rome, Italy). *Minerva Med.* 66(26):1504-1508, 1975.

Kallikrein determinations were performed on 24-hr urine specimens from 33 patients with alcoholic cirrhosis (31 men and 2 women, aged 27-66 yr) which was accompanied by ascites in 22 cases and by esophageal varices in 20. In most cases, the diagnosis was established by biopsy and, in some cases, by autopsy. None of the patients had increased blood urea nitrogen or creatinine levels, their pancreatic function was within normal limits, and none of the patients had arterial hypertension or diabetes. For several days before urine was collected, none of the patients received low-sodium diets or vitamin K, diuretics, steroids, or other drugs. Controls consisted of 22 men (aged 19-40 yr) with normal blood pressure, normal blood sugar levels, and normal liver and kidney function. After precipitation of protein from urine with acetone, 24-hr dialysis with running water, and removal of insoluble material by centrifugation, esterase activity was determined in 1 ml of urine extract spectrophotometrically, using benzoylarginine ethyl ester (BAEE) as substrate. Values for urinary kallikrein excretion, expressed in esterase U (1 esterase U is equivalent to the hydrolysis of 0.05 μM BAEE/min), ranged from 13.20 to 39.50 esterase U/24 hr (mean 24.44 ± 1.66 esterase U/24 hr) in controls and from 18.68 to 82.50 esterase U/24 hr (mean 39.42 ± 2.84 esterase U/24 hr) in patients with cirrhosis. The increase in urinary kallikrein excretion in cirrhosis was highly significant, with the highest values being found in patients with ascites. Since there is a functional relation between urinary kallikrein and the renin-angiotensin-aldosterone system, the high values for urinary kallikrein excretion found in cirrhotics might be correlated with increases in renin and aldosterone which have been reported to occur in cirrhosis.

9166 PATHOGENESIS OF RENAL FAILURE IN CIRRHOSIS AND FULMINANT HEPATIC FAILURE. *(E.)* Wilkinson, S. P.; Portmann, B.; Hurst, D.; Williams, R. (King's Coll. Hosp., London S.E.5, England). *Postgrad. Med. J.* 51(598):503-505, 1975.

Literature concerning the pathological characteristics of acute renal failure in cirrhosis and fulminant hepatic failure is discussed. The measurement of urinary lysozyme concentrations is suggested to be an index of tubular integrity. In 19 of 37 patients with renal failure and associated fulminant hepatic failure or cirrhosis, normal urinary lysozyme concentrations indicated intact tubular function. A continuous range of concentrations have been found in both fulminant hepatic failure and cirrhosis, suggesting a complete spectrum of renal failure. Examination of 64 patients dying of fulminant hepatic failure demonstrated that renal failure does not reflect the severity of the hepatocellular destruction. Factors precipitating functional renal failure include gastrointestinal hemorrhage, infection, and paracentesis abdominis. Plasma expansion values are normal or elevated in patients with fulminant hepatic failure and functional renal failure. Renal arteriograms show the mechanism of the functional renal failure of cirrhosis to be a profound vasoconstriction of the major branches of the main renal artery and intrarenal vessels. Whereas systemic endotoxemia was found only in patients with a glomerular filtration rate of 25 ng/ml, serial studies indicated renal failure development shortly after endotoxemia detection. Both fulminant and functional renal failure were seen in relation to endotoxemia. Whereas a strongly positive limulus assay was found in only one of ten patients with functional renal failure and cirrhosis, it is suggested that the effective endotoxin concentrations are not always detectable by this assay. This functional renal failure is due to active renal vasoconstriction, which may be due to systemic endotoxemia.

9167 RENAL RETENTION OF SODIUM IN CIRRHOSIS AND FULMINANT HEPATIC FAILURE. *(E.)* Wilkinson, S. P.; Moodie, H.; Alam, A.; Williams, R. (King's Coll. Hosp. and Medical Sch., Denmark Hill, London S.E.5, England). *Postgrad. Med. J.* 51(598):527-531, 1975.

The relative roles of changes in intrarenal hemodynamics and hyperaldosteronism in the pathogenesis of sodium retention were evaluated in patients with cirrhosis and a glomerular filtration rate greater than 90 ml/min. No relation of sodium excretion (2-74 mEq/day) with glomerular filtration rate could be found. Using the technique of deconvolution analysis of a ^{131}I-hippuran renogram, it is concluded that while intrarenal redistribution of blood flow occurs in cirrhosis, it is not directly related to sodium excretion. An inverse hyperbolic relationship between sodium excretion and urinary aldosterone 18-glucuronide was found. In evaluating possible factors leading to hyperaldosteronism, a close correlation was found between increased plasma renin activity and increased aldosterone excretion. While impaired degradation by the liver may be a contributory factor, increased secretion was deemed quantitatively more important. In addition, cirrhosis patients with a redistribution of blood flow away from the outer cortex (without detectable ascites) had significantly higher values for plasma renin activity than those with a normal pattern of intrarenal blood flow distribution. Escape from the sodium-retaining effects of hyperaldosteronism was dependent on the expansion of the effective total extracellular fluid, which in turn was dependent upon ascites formation. In both moderate and markedly reduced renal perfusion (20-90 ml/min), sodium retention is thus concluded to be a result of a combination of hyperaldosteronism and reduced perfusion. Data on renal function in fulminant hepatic failure suggest the nephron proximal tubule as a site of abnormal sodium retention.

9168 STUDIES OF RENIN AND ALDOSTERONE IN CIRRHOTIC PATIENTS WITH ASCITES. *(E.)* Rosoff, L., Jr.; Zia, P.; Reynolds, T.; Horton, R. (Los Angeles County Univ. South. California Med. Cent.). *Gastroenterology* 69(3):698-705, 1975.

The effects of posture, dietary salt intake, drug-induced diuresis, and blockage of aldosterone biosynthesis on plasma renin activity and the metabolic clearance rate of aldosterone were investigated in 9 patients with severe alcoholic liver disease and refractory, moderately tense ascites; all but 1 of these patients had avid renal sodium retention. Determinations were also made of urinary volume, urine electrolytes, serum urea, serum nitrogen, serum creatinine, and plasma cortisol. All patients initially showed marked elevations in plasma renin and aldosterone concentrations while in the supine position. Both parameters showed further significant increases after the patients stood erect for 1 hr, but these increases were not as great as those observed in normal subjects. The plasma aldosterone concentrations increased largely as a result of increased aldosterone secretion rather than of decreased metabolic clearance. Sodium restriction to 20 mEq/day for 1 week had no significant effect on the mean plasma renin or aldosterone values, while administration of furosemide (40 mg twice a day) and triamterene (100 mg twice a day) to stimulate diuresis was associated with a moderate decrease in supine plasma aldosterone in 1 patient and no change in another. However, in 4 of 6 patients undergoing spontaneous diuresis the plasma renin activity and plasma aldosterone concentration returned to normal. Aminoglutethimide treatment (1-2 g/day p.o.) combined with dexamethasone (0.5 mg twice a day) caused marked and rapid decreases in the supine plasma aldosterone concentrations in all 3 patients studied; in 2 of these patients there was a slight rise in the plasma renin activity. Significant increases in diuresis did not occur, even after 2 weeks of treatment. Sodium excretion was poorly correlated with plasma renin activity and plasma aldosterone. The data suggest that renal tubular events independent of hyperaldosteronism play an important role in the sodium retention observed with cirrhosis and ascites.

9169 OUR EXPERIENCE IN THE TREATMENT OF CIRRHOTIC ASCITES BY REINJECTION OF CONCENTRATED ASCITES FLUID. *(Fr.)* Terrasse, J.; Moinade, S.; Coignet, F. (No affiliation given). *Rev. Fr. Gastroenterol.* (106):7-8, 11-14, 17, 1975.

Treatment of cirrhotic ascites by reinjection of concentrated ascitic fluid is a procedure used when patients are classified as "untreatable" after prolonged medical treatment. The patient pool comprised 18 subjects (3 women and 15 men, mean age 55 yr). The treatment was a low-salt diet with repeated ascites punctures, diuretics and albumin injections. A procedure of reinjection of concentrated ascitic fluid using the Rhodiascit, released water and sodium and retained proteins. This resulted in decreased edema in the legs and the blood volume returned to normal levels. The indications for the reinjections were: the ascites was not affected by diuretics (9 cases), preoperative preparation for an APC (1 case), celiac surgery (1 case), functional renal insufficiency (6 cases) and the threat of umbilical rupture (1 case). Tolerance for reinjection was remarkable. The side effects were few and of short duration. They included temperature elevation, chills, lumbar pains, and intense asthenia. Most of these effects were the functions of the concentration of the reinjected material. Deaths during reinjection resulted from the disseminated intravascular coagulation and fibrinolysis. Overall, this therapeutic procedure is most beneficial for the patient.

9170 CONCENTRATION-REINFUSION (CR) OF ASCITIC FLUID IN THE TREATMENT OF DECOMPENSATED LIVER CIRRHOSIS WITH DIURETIC-RESISTANT ASCITES. *(E.)* Venture, E.; Zeneroli, M. L. (Inst. Clinical Medicine, Univ. Modena, Modena, Italy). *Postgrad. Med. J.* 51(598):577-580, 1975.

The application of the concentration-reinfusion (CR) technique was evaluated in 20 cases of liver cirrhosis with diuretic-resistant ascites. During the CR procedure, both water and electrolyte excretion were markedly increased. There was also an increase in glomerular filtration rate and in urinary Na/K ratio. Body weight was significantly decreased. The acute effect of CR on water and sodium diuresis disappeared within 48 hr from the start of the procedure. Subsequent administration of saluretic and potassium-sparing drugs acting at different levels of the renal tubule again induced diuresis and completed the removal of the ascites. In patients with ascites and massive edema, as well as low serum albumin levels and renal failure, a delayed diuretic response to CR is almost the rule and may be dangerous because of fluid overload. In cases such as these a forced saluresis needs to be induced by using frusemide to prevent possible cardiovascular complications. In all of these patients the CR technique was well tolerated; the only consistent side effects were mild fever, transient thirst, and hypotension. Two of the patients died at 7 and 10 days after CR for massive gastrointestinal bleeding. Six patients were controlled as out-patients by conventional diuretic drugs for 4 to 8 months. It is stressed that the ascites CR technique as current therapy is probably too expensive and should not be viewed as a substitute for the diuretic drugs in diuretic-responsive ascites. However, it is concluded to be an important method in the management of diuretic-resistant ascites.

9171 INFLUENCE OF AZATHIOPRINE ON CIRRHOSIS IN HUMANS AND IN ANIMAL EXPERIMENTS. *(Ger.)* Perings, E.; Brunner, G.; Creutzfeldt, W. (Med. Clin., Gottingen Univ., Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:946-948, 1973.

Improvements in serum transaminase activities, γ-globulin levels, and histological findings occurred in about 90% of 54 patients with chronic aggressive hepatitis after administration of 2 to 3 mg/kg/day of azathioprine for as long as eight yr. In contrast, 10 of 21 patients with cirrhosis died during azathioprine therapy or shortly after its discontinuation and showed less improvement in liver function tests and histological findings than patients with chronic aggressive hepatitis. To account for the deleterious effect of azathioprine in cirrhosis, experiments were performed on 122 male Wistar rats with cirrhosis induced by administration of carbon

tetrachloride (CCl_4; 0.75 ml/kg twice a week, s.c.) and on 30 rats with cirrhosis induced by a choline-deficient diet. Rats were given: (1) 26 CCl_4 injections, followed by 25 mg/kg/day of azathioprine, p.o., and six more injections of CCl_4; (2) 35 CCl_4 injections, followed by 25 mg/kg/day of azathioprine, p.o. for 36 days; (3) 34 CCl_4 injections, followed (10 days later) by 25 mg/kg/day of azathioprine, p.o. for four wk; and (4) a choline-deficient diet for eight months, followed by 25 mg/kg/day of azathioprine, p.o. for four wk. Controls for groups 3 and 4 received 1 ml/day of water, p.o. In all four groups, about 50% of the rats given azathioprine died within four wk. Of 62 controls with cirrhosis, only three died during the same period. Azathioprine-treated rats in groups 1 and 2 also had significantly higher SGOT and SGPT activities than untreated controls. A good correlation was found between histological findings and serum transaminase activities, both in cirrhosis induced by CCl_4 and that induced by a choline-deficient diet. To rule out the toxic effect of azathioprine, 25 mg/kg/day was administered to 20 healthy rats for 90 days. No histological changes in the liver or increases in serum transaminase activities were observed. These findings suggest that azathioprine is metabolized more slowly in rats with parenchymal liver damage and that it produces damage by flooding their liver cells. On the basis of these results, it is concluded that cirrhosis is a contraindication for azathioprine therapy.

9172 EFFECTS OF CLOFIBRATE IN PRIMARY BILIARY CIRRHOSIS HYPERCHOLESTEROLEMIA AND GALLSTONES. *(E.)* Summerfield, J. A.; Elias, E.; Sherlock, S. (Royal Free Hosp., London, NW3 2QG, England). *Gastroenterology* 69(4):998-1000, 1975.

The effects of clofibrate in a patient with primary biliary cirrhosis are reported. The 52-yr-old woman developed xanthelasma, pruritus, and jaundice, and was given short courses of treatment with corticosteroids and cholestyramine. One gram of clofibrate per day was administered for two months. The patient developed pruritis, jaundice, nausea, and epigastric discomfort, upon which the clofibrate was discontinued. Serum cholesterol was 1,700 mg/dl. A retrograde endoscopic cholangiogram showed multiple intrahepatic gallstones, and a liver biopsy showed a severe periportal cholestasis. Serum cholesterol dropped to 1,125 mg/dl one month after the administration of clofibrate was discontinued, at which time administration of cholestyramine (12 g/day) and chenodeoxycholic acid (125 mg/day) were commenced. Within three months, the serum cholesterol dropped to 665 mg/dl and the stones disappeared. The patient's response is consistent with previously reported observations. The author concludes that the paradoxical rise in serum cholesterol may be reconciled with the production of lithogenic bile and stone formation.

9173 COGNITIVE DEFICITS ASSOCIATED WITH CHRONIC HEPATIC ENCEPHALOPATHY AND THEIR RESPONSE TO LEVODOPA. *(E.)* Elithorn, A.; Lunzer, M.; Weinman, J. (Royal Free Hosp., Pond Street, London, N.W.3, England). *J. Neurol. Neurosurg. Psychiatry* 38(8):794-798, 1975.

The effect of levodopa on patients with chronic hepatic encephalopathy (CHE) was investigated. A battery of computer based psychological tests was given to seven patients with established CHE, seven control patients with cirrhosis, and seven patients without liver disease. The groups were matched for sex, age (53.6-55.8 yr), and verbal IQ. The battery included measures of route-finding, coding, short-term memory, multiple choice, and simple reaction time and motor tapping. The CHE patients had lower mean scores on all tests than either of the two control groups; the impairment was most marked on speed-based measures and short-term memory. Administration of levodopa to four patients resulted in an overall improvement, which was still below the performance level of the control groups. The patients had improved scores on speed-based tests, yet did less well on tests of memory and attention; hence, a mixed effect of levodopa on cognitive skills is apparent. An unexpected finding was the evidence of intellectual loss found in two patients with liver disease and undiagnosed encephalopathy. It is concluded that levodopa has both an anti-depressant and stimulatory effect. Its effect on intellectual functions is secondary to the stimulatory effect and is consequently dependent upon the emotional and attentional status of the patient.

9174 EFFECT OF PORTACAVAL ANASTOMOSIS ON RENAL BLOOD FLOW IN CIRRHOSIS--PRELIMINARY RESULTS. *(E.)* Ring-Larsen, H.; Hesse, B.; Stigsby, B. (Univ. Hosp., Copenhagen, Denmark). *Postgrad. Med. J.* 51(598):499-502, 1975.

The influence of the augmented portal pressure and the postulated "diminished effective circulating plasma volume" on the renal blood flow in patients with cirrhosis of the liver was investigated. Six patients with cirrhosis and portal hypertension had undergone hemodynamic investigation before and after portal decompression; all but one had and end-to-side portacaval shunt. The shunt caused a significant fall in the splenic pressure in all patients; however, the pressure was not always completely normalized. Liver function tests for galactose elimination capacity remained unchanged in 80%, as did pulse rate, mean arterial blood pressure, and renal vascular resistance. The right atrium, wedged pulmonary artery, and wedged hepatic vein pressures also remained unchanged. The plasma volume generally increased after surgery from 3.50 l to 3.65 l. Cardiac output was greater after anastomosis (5.15 l/min before, and 6.85 l/min after), caused exclusively by an increased stroke volume from 67 ml to 88 ml. The study did not establish a relation between recovery of renal perfusion and portacaval end-to-side anastomosis. The possible effects of a side-to-side shunt plus the theory of circulating vasoactive agents were considered.

9175 PROGNOSIS AFTER PORTOCAVAL ANASTOMOSIS: A 15-YEAR FOLLOW-UP. *(E.)* Windle, R.;

Peacock, J. H. (Royal Infirmary, Bristol, England). *Br. J. Surg.* 62(9):701-706, 1975.

Fifty-seven patients who had undergone portacaval anastomosis more than 15 yr ago were studied to ascertain the late effectiveness of the operation in the stopping of bleeding and the resultant side effects. There were 35 males and 22 females (average age 33 yr). Four patients (7%) died during the postoperative period, 25 died subsequently, and 27 (48.2%) were alive at the time of the study. The cause of death was hepatic failure in 68% of those who did not survive. Encephalopathy developed in 19% of the patients within five yr of the operation; an additional eight patients developed encephalopathy within the next five yr. Further hemorrhage occurred in eight patients, peptic ulceration in eight, and diabetes mellitus in five. Of the 34 patients with cryptogenic cirrhosis surviving the postoperative period, 22 (64%) were alive after 15 yr; deaths had resulted from hepatic failure, respiratory complications, pyosalpinx, peptic ulcer hemorrhage, and cardiac failure. Eighty-two percent of the patients with this type of cirrhosis who were under 30 yr at operation were alive after 15 yr; none of the patients over 40 yr at operation were alive at this time. Of the 22 survivors with cryptogenic cirrhosis, liver function tests remained unchanged in nine, deteriorated with subsequent recovery in six, and deteriorated without remission in five. All nine patients with a history of jaundice prior to cirrhosis died within 13 yr of surgery. The results may suggest that young cryptogenic cirrhotic patients with no encephalopathy are best benefitted by the surgery. A poor prognosis is suggested by deterioration in liver function, and the development of encephalopathy may indirectly indicate a poor long-term prognosis.

9176 INTERFERENCE WITH SYMPATHETIC FUNCTION AND CATECHOLAMINE RESPONSIVENESS IN LIVER DISEASE [abstract]. *(E.)* Manghani, K. K.; Ginsburg, J.; Newman, S. P.; Bernard, A. G.; Lunzer, M. R.; Sherlock, S. (R. Free Hosp., London, England). *Gut* 16(5):399-400, 1975.

9177 PORTAL HYPERTENSION INDUCED BY VINYL CHLORIDE [abstract]. *(E.)* Smith, P. M.; Williams, D. M. J.; Crossley, I. R. (Llandough Hosp., Penarth, Glamorgan, England). *Gut* 16(5):402-403, 1975.

9178 A TRIAL OF COLCHICINE IN LIVER CIRRHOSIS [abstract]. *(E.)* Kershenobich, D.; Uribe, M.; Rojkind, M. (Instituto Nacional de la Nutricion, Mexico, D. F.). *Gastroenterology* 68(4): 1078, 1975.

9179 PRESENCE OR ABSENCE OF ESOPHAGEAL VARICES (EV) ON PROGNOSIS IN CIRRHOSIS: A PROSPECTIVE INVESTIGATION [abstract]. *(E.)* Snyder, N.; Reboucas, G.; Brodoff, M.; Conn, M. B.; Conn, H. O. (VA Hosp., West Haven, Conn.) *Gastroenterology* 68(4):1070, 1975.

9180 EFFECT OF PORTACAVAL ANASTOMOSIS ON HYPERSPLENISM IN CIRRHOSIS: A PROSPECTIVE CONTROLLED EVALUATION [abstract]. *(E.)* Mutchnick, M. G.; Lerner, E.; Conn, H. O. (VA Hosp., West Haven, Conn.). *Gastroenterology* 68(4):1070, 1975.

9181 SULFATION AND REHYDROXYLATION OF DEOXYCHOLIC ACID (DCA) IN ALCOHOLIC CIRRHOSIS: A DETERMINANT OF LOW BILIARY DCA [abstract]. *(E.)* Mehta, S.; Kaye, M.; Davis, R.; Struthers, J.; Naylor, J. (VA Hosp., Denver, Colo.). *Gastroenterology* 68(4):1060, 1975.

9182 STEATOSIS OR ALCOHOLIC HEPATITIS AS PRECURSORS OF CIRRHOSIS [abstract]? *(E.)* Bordalo, O.; Batista, A.; Noronha, M. (Hosp. Santa Maria, Lisbon, Portugal). *Gastroenterology* 68(4):867, 1975.

9183 GASTRIC SECRETION AND BASAL GASTRINAEMIA IN CIRRHOTIC PATIENTS. *(Fr.)* Bekhti, A.; Brassinne, A. (Institut de Medecine, Univ. de Liege, Liege, France). *Acta Belg.* 38(3-4):101-110, 1975.

9184 PERIARTERIAL NEURECTOMY OF THE COMMON HEPATIC ARTERY IN CHRONIC HEPATITIS AND CIRRHOSIS IN CHILDREN. *(Rus.)* Akopyan, V. G.; Pshenichnikov, V. N.; Kleimenova, I. I.; Doletsky, A. S. (Dept. Pediatric Surgery, Central Scientific Res. Lab., Moscow, USSR). *Khirurgiia* (1):81-87, 1975.

9185 CHANGES IN GASTROINTESTINAL CANAL IN LIVER CIRRHOSIS. *(Rus.)* Dashkovskaya, V. S.; Voronkin, G. V. (Dept. Pathoanatomy, M. V. Sklifosovskiy Moscow Scientific Res. Inst. First Aid, USSR). *Khirurgiia* (1):95-99, 1975.

9186 THE USE OF ERYTHROCYTIC SUSPENSION PRESERVED ON MANNITE SOLUTION IN PATIENTS WITH CIRRHOSIS OF THE LIVER. *(Rus.)* Zherebtsov, L. A.; Ginzburg, F. G.; Ten, D. D.; Sharova, Y. A.; Zamchy, A. A. (Clinic of Hemotherapy, Central Inst. of Hematology and Blood Transfusion, Moscow, USSR). *Probl. Gematol. Pereliv. Krovi.* 20(4):27-31, 1975.

9187 DIAGNOSTIC VALUE OF POLYPROJECTION HEPATOSCANNING IN LIVER CIRRHOSIS. *(Rus.)* Sukirno, M. S.; Suchkov, A. V.; Yudin, L. A. (I. M. Sechenov First Moscow Medical Institute, Moscow, USSR). *Med. Radiol. (Mosk.)* 20(4):17-24, 1975.

9188 FECAL LIPIDS. PART IV: STUDY OF THE FECAL ELIMINATION OF GLYCERIDES IN NORMAL AND IN CIRRHOTIC ADULTS. *(Sp.)* Mostaza, C. P.; Bonet, J. V.; Vilardell, A. C.; Aguilar, L. G.; Torello, E. C.; Bullich, J. P.; Puges, A. M. G.; Duro, M. A. G. (Hosp. Clinico y Provincial, Univ. de Barcelona, Barcelona, Spain). *Rev. Clin. Esp.* 135(4):347-352, 1974.

9189 BILE SALTS IN ASCITIC FLUID [abstract]. *(E.)* Banfield, W. J.; Hammerman, K.; Admirand, W. H. (Dept. Med., Univ. California, San Francisco, Calif.). *Gastroenterology* 68(4):1068, 1975.

9190 EVALUATION OF THE FUNCTIONAL STATE OF THE LIVER IN CIRRHOSIS AND EXTRAHEPATIC PORTAL HYPERTENSION. *(Rus.)* Lytkin, M. I.; Vlasov, V. S.; Yerukhin, I. A. (Clinic Surgery, S. M. Kirov Military Medical Acad., Leningrad, USSR). *Khirurgiia* (1):56-62, 1975.

9191 NOTES ON HEPATIC FUNCTION AFTER MESOCAVAL INTERPOSITION SHUNT FOR PORTAL HYPERTENSION. *(It.)* Roncoroni, L.; Sgobba, G.; Violi, V.; Peracchia, A. (Istituto di Clinica Chirurgica Generale, Univ. Parma, Parma, Italy). *Ateno Parmense [Acta Biomed.]* 45(4-5):235-245, 1974.

9192 THE ARTERIOGRAPHIC APPEARANCES OF THE HEPATIC ARTERIES IN PORTAL HYPERTENSION. *(Ger.)* Frommhold, H.; Bucheler, E.; Boldt, I. (Radiologische Klinik der Univ., 53 Bonn-Venusberg, Germany). *Fortschr. Rontgenstr.* 121(6):728-737, 1974.

9193 PRELIMINARY OBSERVATIONS ON THE METHOD OF REINFUSION OF ASCITES IN HEPATIC CIRRHOSIS. *(It.)* Fiaccadori, F.; Aurier, E.; Ghinelli, F.; Pelosi, G.; Pizzaferri, A.; Pizzigoni, G.; Sgobba, G. (Ospedale Regionale di Parma, 43100 Parma, Italy). *Ateno Parmense [Acta Biomed.]* 45(405):257-270, 1974.

9194 MECHANISM OF DEVELOPMENT OF PORTAL HYPERTENSION IN LIVER CIRRHOSIS. *(Rus.)* Kalashinikov, S. A. (S. P. Fedorov Faculty Clin. Surgery, S. M. Kirov Military Medical Acad., Leningrad, USSR). *Klin. Med. (Mosk.)* 53(4):74-78, 1975.

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9196 LIVER CIRRHOSIS (NON-HEMOCROMATOSIC), DIABETES MELLITUS. II. INCIDENCE OF CHEMICAL DIABETES IN A GROUP OF 106 CIRRHOTIC PATIENTS. *(Sp.)* Vallejo, A. C.; Zurro, A. M.; Benumea, F. C.; Vasquez, J. O. (Dept. Interna Medicina, Clinica "La Paz," Univ. Autonoma de Madrid, Madrid, Spain). *Rev. Clin. Esp.* 134(4):355-262, 1974.

9197 GLYCOPROTEINS AND THE LIVER. I. CHARACTERISTICS OF THE SERUM GLYCOPROTEIN SPECTRUM IN LIVER CIRRHOSIS. *(Sp.)* Leyba, C. O.; Rodriquez-Pinero, J.; Diaz, J. P.; Guijo, P. S.; Ortiz, J. V.; Castain, C. N.; Redondo, F. M. (Facultad de Medicina de Sevilla, Seville, Spain). *Rev. Clin. Esp.* 134(4):343-350, 1974.

9198 THROMBOPLASTIN-FORMATION FACTORS AND CIRRHOSIS OF THE LIVER. *(Sp.)* Rocha, E.; Marin, J.; Lopez Borrasca, A. (Residencia Sanitaria de la Seguridad Social, San Sebastian, Guipuzcoa, Spain). *Sangre (Barc.)* 20(1):38-42, 1975.

9199 INTERRELATION OF CHRONIC HEPATITIS AND LIVER CIRRHOSIS WITH FUNCTIONAL DISTURBANCES OF OTHER SYSTEMS AND ORGANS. *(Rus.)* Kurdybailo, F. V.; Yakhonlova, O.I.; Shulutko, B. I.; Mokhov, V. M. (Dept. Hosp. Therapy, Leningrad Sanitary Hygiene Medcal Inst., Leningrad, USSR). *Sov. Med.* (3):83-87, 1975.

9200 CLINICAL PICTURE OF POSTHEPATIC CIRRHOSIS OF THE LIVER. *(Rus.)* Khazanov, A. I. (No affiliation given). *Klin. Med. (Mosk.)* 53(4): 69-73, 1975.

9201 LIVER CIRRHOSIS (NON-HEMOCHROMATOSIC), DIABETES MELLITUS. III. INSULIN SECRETION IN CIRRHOTIC PATIENTS TOLERANT OR INTOLERANT TO ORAL GLUCOSE STRESS. *(Sp.)* Vallejo, A. C.; Buzo, T. J.; Franco, F. S.; Vazquez, J. O. (Dept. de Interna Medicina Clinica "La Paz," Univ. Autonoma de Madrid, Madrid, Spain). *Rev. Clin. Esp.* 134(5):441-448, 1974.

9202 INTRAHEPATIC RESISTANCE IN THE HEMODYNAMIC DIAGNOSIS OF PORTAL HYPERTENSION. *(It.)* Torre, G. C.; Mattioli, F.; Diana, A. (Istituto di Clinica Chirurgica Generale e Terapia Chirurgica, Univ. di Genova, Genova, Italy). *Arch. Chir.* 12(2): 61-68, 1975.

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9204 SERUM CHOLINESTERASE ACTIVITY IN LIVER DISEASE [abstract]. *(E.)* Contorno, A.; Filippazzo, G.; Mancuso, L.; Pagliaro, L.; Palazzo, U.; Pinzello, G. (Patologia Medica dell'Universita, Palermo, Italy). *Rend. Gastroenterol.* 6(3):207, 1974.

9205 PRELIMINARY RESULTS ON GASTRIC SECRETION AND BLOOD GASTRIN LEVELS IN CIRRHOSIS OF THE LIVER [abstract]. *(E.)* Coltorti, M.; De Simone, A.; Del Vecchio-Blance, C.; Di Cesare, D.; Caporasom, N. (Clinica Medica, Facolta Medica I dell'Universita, Napoli, Italy). *Rend. Gastroenterol.* 6(3):206, 1974.

9206 HEPATIC STORAGE (S) AND TRANSPORT MAXIMUM (Tm) OF BSP IN CHRONIC LIVER DISEASES: CORRELATIONS WITH HEPATIC BLOOD FLOW AND WITH SOME LIVER FUNCTION TESTS [abstract]. *(E.)* DiSimone, A.; Gentile, S.; Riegler, G.; Coltorti, M. (Istituto di Clinica Medica, I Facolta dell'Universita, Napoli, Italy). *Rend. Gastroenterol.* 6(3):209, 1974.

9207 ELECTRON MICROSCOPIC OBSERVATION AND X-RAY ANAYSIS OF THE LIVER IN SECONDARY HEMOCHROMATOSIS. *(E.)* Takazawa, T.; Mikuni, C.; Ibayashi, J.; Sato, T. (Hokkaido Center, Hokkaido, Japan). *Nihon Rinsho Denshi Kenbikyo Gakkai-Shi* 7(3-4):360, 1974.

9208 HBAg ANTIGEN IN LIVER CIRRHOSIS IN WESTERN SICILY [abstract]. *(E.)* Dardanoni, L.; Filippazzo, G.; Genova, G.; Pagliaro, L.; Palazzo, U.; Pinzello, G.; Spano, C.; Triolo, G. (Divisione di Medician del'Ospedale, Palermo, Italy). *Rend. Gastroenterol.* 6(3):208, 1974.

9209 TRUNCULAR OR RADICULAR PORTOCAVAL DERIVATIONS IN THE TREATMENT OF BANTI SYNDROME IN BLACK AFRICA. *(Fr.)* Moulin, F.; Outin, J.; Loper-Vieira, J.; Grisez, J. (Chirurgien des Hopitaux des Armees, Hopital de Brazzaville, Republique Populaire du Congo). *Med. Tropicale* 34(6):758-766, 1974.

9210 HEPATOGENIC PATHOLOGY OF THE BRAIN ACCORDING TO ELECTROENCEPHALOGRAPHIC STUDIES. *(Rus.)* Mansurov, K. K.; Pologutin, A. K. (Inst. of Gastroenterology, Acad. of Sciences of the Tadzhik SSR, Dushanbe, USSR). *Ter. Arkh.* 47(2):60-67, 1975.

9211 DISORDERS OF FLUID-ELECTROLYTE BALANCE IN CHRONIC HEPATITIS AND CIRRHOSIS OF THE LIVER. *(Rus.)* Dederer, Y. M.; Rozhkova, T. A. (Dept. of General Surgery, Altay Medical Inst., Barnaul, USSR). *Ter. Arkh.* 47(2):72-78, 1975.

9212 ADVANCES IN SURGERY FOR PORTAL HYPERTENSION. *(Sp.)* Mendez, S. M.; Reyes, D. S. A.; Rodriquez, A. B.; Alburquerque, L.; Zarayo, R. V.; Crespo, A.; Gonzalez, M. (Ciudad Sanitaria "Virgen del Rocio," Dept. de Cirugia, Sevilla, Spain). *Rev. Esp. Enferm. Apar. Dig.* 45(5):483-530, 1975.

9213 EPIDEMIOLOGY AND PREVENTION OF HEPATIC CIRRHOSES. *(Sp.)* Perez, M. L. (Departamento de Investigacion Cientifica del Instituto Mexicano del Seguro Social, Mexico). *Salud Publica Mex.* 16 (4):601-605, 1974.

See also, 8517, 8531, 8540, 8615, 8909, 8952, 8960, 8971, 8973, 8981, 9023, 9026, 9044, 9092, 9132, 9139, 9141, 9147, 9155, 9156, 9158, 9214.

LIVER AND BILIARY TRACT

Gallbladder and Biliary Tract Diseases

9214 PRIMARY BILIARY CIRRHOSIS WITH CANCER OF THE AMPULLA OF VATER. *(E.)* Makipour, H.; Winkelman, E. I. (no affiliation given). *Cleveland Clin. Q.* 42(2):209-213, 1975.

A case of carcinoma of the ampulla of Vater occurring with primary biliary cirrhosis is reported. A 57-yr-old white woman was hospitalized with jaundice and diarrhea of 8 to 9 months duration, mild right upper quadrant abdominal discomfort, generalized bone pain, weight loss, scleral icterus, and multiple spider angiomas on the face and neck. The spleen was palpable 2 cm below the left costal margin and the liver span was 30 cm. Antimitochondrial antibody was positive at greater than 1:160 serum dilution, and smooth muscle antibody and antinuclear factor were negative. A cork bore biopsy of the liver showed portal fibrosis and chronic inflammatory infiltrate comprised of lymphocytes and plasma cells. The ducts were reduced and replaced by ill-defined lymphoid aggregates. The findings were compatible with primary biliary cirrhosis, for which a high protein diet and diphenoxylate hydrochloride were prescribed. During the following 6 months, the patient developed pruritus and continued to have diarrhea and weight loss. Results of a second physical examination were similar to those of the first except for the presence of bilateral periorbital xanthelasma. At laparotomy, a 3.5-cm, firm, rubbery mass was found in the head of the pancreas. Operative cholangiogram showed complete obstruction of the distal common duct with proximal dilatation. Needle biopsy specimens of the pancreas indicated pancreatitis and a transduodenal biopsy of the ampulla of Vater showed well-differentiated adenocarcinoma. A Whipple's procedure was performed three wk later, and the patient was discharged on a regimen of pancreatin, cholestyramine, and diphenoxylate hydrochloride. Over the next 30 months she continued to have severe diarrhea with generalized bone pain due to demineralization of all bony structures; her stool fat was 272 g/72 hr. The patient died following the development of hepatoencephalopathy. Autopsy revealed no recurrence of metastatic tumor, but showed a small calculus in the pancreatic duct. This case demonstrates the value of the antimitochondrial antibody and the potential role of endoscopic retrograde cholangiopancreatography in establishing a correct diagnosis.

9215 EMPHYSEMATOUS CHOLECYSTITIS. *(Ger.)* Muller, K. H. G. (Katharinenhospital, D-7000 Stuttgart-1, Kriegsbergstr. 60, Germany). *Leber Magen Darm* 5(1):18-20, 1975.

A case report is presented for a 62-yr-old man with a two-yr history of recurrent pain in the right upper abdomen who was hospitalized for acute colic. Cholecystography in the supine and upright positions

showed a fluid level in the gallbladder but no gas could be detected in the extrahepatic biliary tract. Tomography revealed that the common bile duct was normal in diameter and could be filled with contrast medium. Since the patient had undergone a Billroth II procedure many years before, the duodenum could not be filled with contrast medium and a biliary fistula could not be ruled out. At surgery, a tumor-like abscess the size of a fist was found adhering to the anterior wall of the abdomen. Inside of this abscess there were small stones, a tissue sequestrum which resembled the gallbladder, and brownish pus. No fistula was found between the duodenum and the inside of the abscess. Histological examination showed complete necrosis of the gallbladder. *Escherichia coli* was cultivated from the pus. The patient recovered uneventfully after surgery and antibiotic therapy. This is the 85th case of emphysematous cholecystitis reported in the literature.

9216 VOLVULUS OF THE GALLBLADDER: CASE REPORT AND REVIEW OF THE LITERATURE. (*E.*) Echave, V.; Hampson, L. G. (Montreal General Hosp., 1650 Cedar Ave., Montreal, Quebec, H3G 1A4, Canada). *Can. J. Surg.* 18(5):439-442, 1975.

A case of volvulus of the gallbladder in an 87-yr-old woman is reported. The patient was hospitalized with a severe colic-like pain in the right upper abdominal quadrant of a few days duration. The pain was associated with nausea, but not with vomiting, and the patient had no known history of jaundice, although she did have a 20-yr history of relatively asymptomatic gallstones. Examination revealed guarding in the upper abdomen, a positive Murphy's sign, and no palpable masses. Chest radiography revealed an elevated right hemidiaphragm, calcification of the aorta, and degenerative changes in the spine; abdominal radiographs visualized a single calculus in the region of the gallbladder and feces and air in the colon. Initial treatment consisted of nasogastric suction and i.v. fluids, but the patient's condition did not change appreciably. Laparotomy on the fifth day of hospitalization revealed a greatly distended, completely gangrenous, and excessively mobile gallbladder with little surrounding inflammation. A 270-degree clockwise torsion at the level of the cystic duct was due to an elongated gallbladder mesentery arising from a short base in the liver bed. Detorsion was accomplished, the gallbladder was removed, and the patient recovered. Pathological examination showed evidence of gangrene of the gallbladder and cholelithiasis. Three anatomic abnormalities may lead to volvulus of the gallbladder: the gallbladder lying free in the peritoneal cavity; acquired mesentery; and spinal deformities. The condition is frequently associated with cholelithiasis and is most common in elderly women. It should be included in the differential diagnosis of the acute abdomen, particularly in older women with right upper quadrant pain. The treatment is early cholecystectomy.

9217 ANGIOGRAPHIC FINDINGS IN PATIENTS WITH CHOLEDOCHOLITHIASIS AND OBSTRUCTIVE JAUNDICE. *(E.)* Bree, R. L.; Reuter, S. R. (Univ. Michigan Med. Cent., Ann Arbor). *Radiology* 112(2):291-295, 1974.

Hepatic angiograms of 10 patients with impacted common duct stones and severe jaundice were studied to determine the effects of obstructive jaundice on the angiogram and to determine if inflammatory changes caused by gallstones could be misinterpreted as tumors. Ascending cholangitis was also present in 6 patients. Simultaneous or sequential celiac and superior mesenteric angiography was performed in each patient, and 4 patients had supplemental common hepatic or gastroduodenal angiograms. The angiograms were evaluated for the presence of increased hepatic arterial blood flow and for abnormal vessels in the region of the common duct. Nine of the patients had dilated hepatic arteries, the average diameter of the common hepatic artery being 8.3 cm. An increased number of small artery branches were present in 8 patients, and 3 patients showed duplication of the small hepatic artery branches. The density of the hepatogram was increased in 7 cases. Thus, all 10 patients had more than one angiographic indication of increased hepatic artery blood flow. A nonhomogeneous hepatogram consisting of a patchy mottled appearance throughout the liver was present in 7 cases. Two patients with particularly nonhomogeneous hepatograms and rounded defects, probably representing dilated hepatic ducts, were misdiagnosed preoperatively has having hepatic metastases. No abnormal vessels were present in the region of the common duct or ampulla of Vater in any case, and no patient was diagnosed as having carcinoma of the biliary tract. The results suggest that the diagnosis of hepatic metastasis be made with circumspection in patients with obstructive jaundice. Additional evidence of metastases should be required for such a diagnosis.

9218 THE ENDOSCOPIC INTRAHEPATIC CHOLANGIOGRAM. CLINICOPATHOLOGIC CORRELATION WITH POSTMORTEM CHOLANGIOGRAMS. *(E.)* Falkenstein, D. B.; Riccobono, C.; Sidhu, G.; Abrams, R. M.; Seliger, G.; Zimmon, D. S. (Manhattan Veterans Admin. Hosp., New York, N.Y.). *Invest. Radiol.* 10(4):358-365, 1975.

In order to aid in the interpretation of intrahepatic cholangiographic patterns obtained during endoscopic retrograde cholangiography, postmortem cholangiographic patterns were correlated with pathologic anatomy. Postmortem cholangiography of the normal biliary tree (of 30 subjects) identified and made possible the naming of the major segmental intrahepatic bile ducts. The retrograde intrahepatic cholangiographic pattern in a normal liver showed smoothly tapering, gently sinuous bile ducts, ramifying outward toward the hepatic surface. In cirrhosis, the biliary tree of nodular livers appeared shrunken with generalized crowding of intrahepatic bile ducts. The finer radicles of the biliary tree exhibited a distinct zig-zagging and corkscrewing. The biliary tree in infiltrative parenchymal process revealed cholangiographic patterns of straightening and elongation of intrahepatic biliary radicles. The bile ducts were spread apart and sometimes extended across the entire upper abdomen. In hepatic tumors, diverse cholangiographic patterns were seen; solitary mass lesions caused smooth, sweeping displacements of intrahepatic bile ducts while metastatic tumors frequently enveloped

and compressed intrahepatic bile ducts. A distinctive pattern of segmental bile duct narrowing with peripheral dilatation was sometimes observed. Large solid intrahepatic tumors were observed that completely blocked an intrahepatic bile duct. If metastases are widespread, a combination of bile duct deviation, stenosis, dilatation or block may occur.

9219 OPERATIVE CHOLANGIOGRAPHY: EVALUATION AND A PLEA FOR ITS GENERAL USE. *(E.)* Nanson, E. M. (Sch. Medicine, Univ. Auckland, Auckland, New Zealand). *Can. J. Surg.* 18(5):449-458, 1975.

The indications for operative cholangiography are evaluated *via* analysis of the records of 109 females and 42 males (mean age 47 yr) undergoing biliary tract surgery, and the technique itself is reviewed. Operative cholangiography was used in 133 of the 151 biliary surgery patients. Among the 18 in whom it was not performed, 14 underwent cholecystectomy and four underwent choledochostomy. Operative cholangiography was not performed in three patients for plausible reasons, but it should have been performed in the other cases. Among the 133 patients in whom operative cholangiography was used, 119 underwent cholecystectomy. In this subgroup of 119 patients, 5 of 88 patients in whom no abnormality of the common bile duct was suspected had "occult" stones and 10 of 31 patients in whom an abnormality of the common bile duct was suspected were shown to have no abnormality; there were no false-negative results. Indications for operative cholangiography include: demonstration of unsuspected stones in the common bile duct; avoidance of unnecessary exploration of the common bile duct; demonstration of abnormal anatomy; demonstration of the nature of the obstruction of the ampulla of Vater; tumors of the intrahepatic biliary tree; establishment of a diagnosis of stenosing cholangitis, cholangiolytic jaundice, or choledochal cyst; clarification of the approach to stones impacted at the lower end of the common bile duct; and demonstration after exploration that the common bile duct contains no stones. The technique of operative cholangiography is simple, but success requires frequent use by a regular team and meticulous attention to details, such as: positioning of the patient and of the diathermy body plate, removal of instruments from the x-ray field, opacification of duct systems, use of the scout film and radiographic technique, injection of contrast medium, and use of the "completion" cholangiogram. In conclusion, operative cholangiography has largely taken the guesswork out of biliary surgery; it carries no significant risk of mortality or morbidity and is an added safeguard for the patient.

9220 AN ALTERNATIVE TO ROUTINE OPERATIVE CHOLANGIOGRAPHY. *(E.)* Day, S. W.; Wagner, C. L.; Kranz, J. M. (No affiliation given). *Am. Surg.* 41(9): 543-545, 1975.

The use of the Fogarty biliary balloon catheter for exploration of the common duct was appraised in a retrospective review of 135 cases undergoing cholecystectomy. In 60 of these patients, cholecystectomy revealed evidence of bile duct calculus (large duct-small stones, jaundice, cloudy bile, pancreatitis, palpable stone, cholangitis, acute cholecystitis) and further exploration with the balloon catheter was undertaken. Stones were found in 33% of those studied in this manner. All explored patients had a T-tube cholangiogram during the postoperative period and no residual stones were found. The finding of small stones or large ducts during common duct exploration was not a very useful indicator of the presence of common duct stones, although both together constituted a much better indication. Similarly, jaundice alone was not a good indicator, but it was significant when combined with other findings. Acute cholecystitis was a good indicator of common duct stones. The results indicate that balloon catheter exploration in conjunction with a careful anatomic dissection of the biliary system constitutes a safe alternative to routine operative cholangiography in many cases. Where the yield of stones is low by exploration, a cholangiogram should be performed.

9221 THE NONOPACIFIED GALLBLADDER ON ORAL CHOLECYSTOGRAPHY. *(E.)* Mujahed, Z.; Evans, J. A.; Whalen, J. P. (New York Hosp.-Cornell Medical Center, New York, N. Y.). *Radiology* 112(1):1-3, 1974.

Nonopacification of the gallbladder on oral cholecystography was studied by reviewing the records of 5,000 patients who underwent oral cholecystography at the New York Hospital between January 1970 and October 1972. In most cases, the patient was given two Telepaque (iopanoic acid) tablets (1 g) every 15 min for 45 min following a fat-free meal on the evening before examination. In the event of nonopacification, the examination was repeated within two days. Of the 5,000 patients reviewed, 75% showed adequate opacification on the first examination. On repeat study in the remaining 25%, opacification was adequate in 827 cases (67%) and inadequate in 413 cases. Among those whose gallbladder was opacified on the second examination, 20% showed evidence of disease (cholelithiasis in 152 cases, adenomyoma in four cases, cholesterosis in three cases, and Rokitansky-Aschoff sinuses in one case). Among the 413 patients whose gallbladders remained nonopacified on the second examination, nonopacification was due to extrinsic causes in 68 (advanced liver disease in 44 cases, previous cholecystectomy in 17 cases, obstruction of the pyloric canal in five cases, cholecystojejunostomy in one case, and failure to administer the Telepaque on the preceding evening in one case). Among the 345 patients in whom nonopacification was not due to extrinsic causes, 152 underwent surgery. All 152 patients showed evidence of disease (chronic cholecystitis with calculi in 134; chronic cholecystitis with acute exacerbation in seven; chronic cholecystitis without calculi in six; cancer of the gallbladder with calculi in three; subacute cholecystitis with calculi in one; and cholangiocarcinoma in one). The results indicate that once all extrinsic causes have been ruled out, nonopacification of the gallbladder on two consecutive examinations is indicative of obstructive gallbladder disease or chronic cholecystitis. I.v. cho-

langiography will produce filling of the gallbladder in the latter but not in the former condition.

9222 LAYERING OF CONTRAST MATERIAL IN ORAL CHOLECYSTOGRAPHY. *(E.)* Bryk, D.; Moadel, E. (Jewish Hosp. and Medical Center, 555 Prospect Place, Brooklyn, N. Y. 11238). *Am. J. Dig. Dis.* 20 (8):727-734, 1975.

To evaluate the layering of bile in the gallbladder seen during p.o. cholecystography, recumbent roentgenograms and a series of erect spot roentgenograms of the gallbladder were taken before and after a commercial fatty meal in 50 patients with no significant clinical evidence of biliary disease. There was considerable variation the contraction of the gallbladder secondary to the fatty meal and in refilling two hr after the fatty meal; however 82% of the cases contracted 20% or more at 30 min and 78% showed refilling of 11% or greater. Layering was related to good contraction and good refilling; of the 30 cases in which layering occurred, 25 showed contraction above 39% and refilling of 11 to 150%, while only five of the 20 patients in which layering did not occur showed a similar degree of contraction and refilling. These differences were highly significant. In three patients, layering occurred before administration of the fatty meal and the contraction produced by the meal eliminated the layering. The results indicate that the layering phenomenon is a manifestation of a normally functioning gallbladder and that it is due to the slow mixing of fresh bile with retained opacified bile. Failure to show layering under these circumstances is presumably due to differences in miscibility of the bile, bile concentration, and patient movement, which would tend to encourage mixing.

9223 PIGMENT VS CHOLESTEROL CHOLELITHIASIS: CLINICAL AND EPIDEMIOLOGICAL ASPECTS. *(E.)* Trotman, B. W.; Soloway, R. D. (Hosp. Univ. Pennsylvania, 3400 Spruce St., Philadelphia, Pa. 19104). *Am. J. Dig. Dis.* 20(8):735-740, 1975.

The influence of clinical and biochemical variations on the type of stone found in patients undergoing cholecystectomy for symptomatic cholelithiasis was studied prospectively in 92 such patients and in a control population of noncholecystectomized patients. In 25 of the cholecystectomized patients, the stone specimens were classified as pigment stones and in 67 they were classified as cholesterol stones. The incidence of cholesterol stones peaked at the fourth decade of life, whereas the incidence of pigment stones peaked in the eighth decade. Sex, but not race, was a significant determinant of stone type: pigment stones occurred with equal frequency in men and women, but cholesterol stones occurred twice as frequently in women as in men. Patients with cholesterol stones weighed significantly more than those with pigment stones whether expressed as actual or ideal weight. The incidences of diabetes, thyroid disease, and alcoholism were similar in the pigment and cholesterol stone groups, as were the hemoglobin, bilirubin, and blood glucose values. Among the 50 black patients with gallstones, heterozygous hemoglobinopathy did not influence stone type. The data confirm that sex (female) and obesity are strongly correlated with cholesterol stone formation, presumably due to excess biliary cholesterol which results in cholecystectomy at a mean age of 43 yr.

9224 CLINICAL COMPARISON OF TYROPANOATE SODIUM, IPODATE SODIUM, AND IOPANOIC ACID. *(E.)* Russell, J. G.; Frederick, P. R. (Latter-Day Saints Hosp., Salt Lake City, Utah). *Radiology* 112(2):519-523, 1974.

The density of gallbladder images and the frequency of side effects, stones, repeat studies, and common duct opacification were compared following the administration of tyropanoate sodium (Bilopaque, 3 g), ipodate sodium (Oragrafin, 3 g), and iopanoic acid (Telepaque, 3 g) in a double-blind fashion to clinical patients requiring gallbladder examinations. A total of 853 examinations were performed. With iopanoic acid, the frequency of adequate opacification on the second study was significantly higher than with either of the other two agents. Also, the frequency of double absent shadows was significantly less with iopanoic acid than with the other agents. The frequency of indeterminate repeat studies was significantly greater with ipodate sodium than with the other agents. The frequencies of abnormal studies with the three media were not significantly different. There were no false positive results, but there were five false negatives; the false negative rate with tyropanoate sodium was 7% and with the other media was 3%. The three agents did not differ significantly with respect to accuracy of radiologic diagnosis. Iopanoic acid yielded the highest frequency of stone demonstration and side effects (diarrhea and dysuria). The choice of contrast medium for oral cholecystography should be decided on the basis of personal preference regarding the density of gallbladder opacification desired and the significance attached to the higher frequency of diarrhea (19%) which occurs with iopanoic acid.

9225 CLINICAL TRIAL OF BILOPAQUE (TYROPANOATE SODIUM) ORAL CHOLECYSTOGRAPHY: EVALUATION OF TIME FOR THE OPTIMAL AND PEAK OPACIFICATION OF THE GALLBLADDER. *(E.)* Han, S. Y.; Witten, D. M. (Univ. Alabama Sch. Medicine, Birmingham, Ala.). *Radiology* 112(3):529-530, 1974.

The time of peak opacification of the gallbladder, the incidence of side effects, and the amount of residual contrast material in the bowel were evaluated in 89 patients to whom tyropanoate sodium (3 mg) was administered 4 to 12 hr prior to cholecystography. The examination was discontinued prior to completion in two patients, and in nine others the gallbladder was not opacified as a result of disease. The gallbladder was opacified in the remaining 78 patients. In 61 of these (78%), it was opacified on the four-hr film; the amount of opacification was graded as poor in 11 cases, fair in 20, good in 25, and excellent in 5. Peak opacification was observed at four hr in 19 patients, six hr in 16, eight hr in 26, ten hr in 14, and 12 hr in three. Residual contrast

material appeared in the bowel in 18 patients; in four cases, dense and coarse particles were seen in the small bowel and ascending colon, whereas in the remaining 14 it appeared as a homogeneous and fluffy density in the small bowel or ascending colon. Residual contrast material in the bowel did not interfere with interpretation of the film in any patient. Fair to good opacification of the common duct was obtained in 13 patients (16%), and three patients suffered mild side effects (nausea in two and diarrhea in one). The results indicate that the optimal time for radiography in tyropanoate sodium cholecystography is from 4 to 8 hr after ingestion of the contrast agent; if visualization is poor at 10 or 12 hr, radiography is warranted.

9226 TIME OF OPTIMAL GALLBLADDER OPACIFICATION WITH BILOPAQUE (TYROPANOATE SODIUM). *(E.)* Oliphant, M.; Whalen, J. P.; Evans, J. A. (New York Hosp.-Cornell Univ. Center, New York, N.Y.). *Radiology* 112(3):531-532, 1974.

The clinical side effects of tyropanoate sodium and the time of earliest maximum visualization of the human gallbladder after ingestion of this agent (3.0 g) were studied in 54 patients. The patients were placed on a fat-free diet beginning 12 hr prior to the start of the study and radiographs were obtained at two-hr intervals from 2 to 12 hr after ingestion of the contrast material and again at 24 hr. Four patients were eliminated because of nonvisualization on the first dose or interference due to gallstones. Of the initial 12 cases, maximum visualization occurred in 11 prior to 12 hr and at 12 hr in the remaining case. In the remaining 38 patients, maximum visualization was obtained within ten hr. Although 8% of the patients showed some visualization at two hr, none showed maximum visualization at this time. Forty-three patients (86%) reached maximum visualization (+3 or + 4) at 6 or 8 hr; 25 of these patients had a grade of +4. Once a maximum visualization was attained, the optimal density remained fairly constant with only minor fluctuations. Thirty-five patients (70%) obtained maximum visual and densitometric peaks at 6 or 8 hr. By eight hr, optimal visualization was observed in 82% of the patients; at ten hr, 98% had reached optimal visualization. Five patients had mild nausea, which was delayed in one case, and one patient complained of mild abdominal cramps. It is concluded that the time necessary for optimal visualization of the gallbladder is significantly less with tyropanoate sodium than with iopanoic acid.

9227 DOUBLE-BLIND STUDY OF FOUR ORAL CHOLECYSTOGRAPHIC PREPARATIONS. *(E.)* Parks, R. E. (Broward Gen. Med. Cent., Fort Lauderdale, Fla.). *Radiology* 112(2):525-528, 1974.

The efficacy and side-effects of iocetamic acid (Cholebrine, 3.0 or 4.5 g administered p.o. in tablet form), tyropanoate sodium (Bilopaque, 3.0 g administered p.o. in the form of capsules), and iopanoic acid (Telepaque, 3.0 g administered p.o. in tablet form) were studied in a double-blind trial in 800 adults requiring cholecystography. All radiographic examinations were reviewed by 2 radiologists who rated the opacity of the gallbladder examination, the visualization of the cystic and common ducts, and residual contrast material in the intestinal tract. These 4 drug dosages did not differ appreciably in the level of their opacity or the gallbladder opacity they produced. Similarly, no significant differences were found in terms of the proportion of patients with good or excellent opacification or in the incidence of repeat examinations for poor visualization. The cystic duct and common bile duct were faintly visualized in only 2 of 938 examinations. Although residual contrast material in the gastrointestinal tract was present in 75% of the examinations, it is not considered significant because residual barium was also present in most patients from a barium enema administered prior to cholecystography. The proportion of patients reporting cramps which were probably drug-related was significantly lower in the 3 g iocetamic acid group than in the iopanoic acid and tyropanoate sodium groups, and the proportion of patients reporting diarrhea was significantly lower in the 3 g iocetamic acid group than in the iopanoic acid group. The data suggest that 3 g iocetamic acid is preferable to the other preparations tested.

9228 ULTRASONIC B-MODE EXAMINATION OF THE GALLBLADDER. *(E.)* Doust, B. D.; Maklad, N. F. (Wayne County General Hosp., Eloise, Mich.). *Radiology* 110(3):643-647, 1974.

Ultrasonic B-mode examinations were performed in 50 patients with known gallbladder size, shape and pathology in order to define the accuracy, limitations, and usage of cholecystosonagraphy in the management of gallbladder disease. The patients were fasted and scanning was performed at intervals of 0.5 cm in the longitudinal axis. In 33 patients, the gallbladders were demonstrated without difficulty, and in 13 others the gallbladders were identified only with much greater difficulty; in the remaining four patients, the gallbladder could not be identified. The normal gallbladder appeared in the transverse scan as a round or oval echo-free area located posteromedially to the right lobe of the liver; in sagittal scans, it appeared as a pear-shaped sonolucent structure on the undersurface of the liver. Difficulty in demonstrating this organ was encountered whenever: it was small, high under the ribs, contained a multitude of small stones, or was sharply angulated; these difficulties were minimized by fasting. Of the 28 patients in whom the gallbladder was known to contain stones, the gallbladder was positively identified in 25 and stones were correctly identified in 21. Four of 22 patients in whom there were no stones were reported as having stones. Generally, the stones appeared on the cholecystosonograms as single or multiple linear echoes located adjacent to the posterior wall of the gallbladder. False positive diagnoses of gallstones were largely preventable if, after delineation of the limits of the gallbladder, the gain was reduced to a level just high enough to allow differentiation of the liver from the gallbladder. Suspension of respiration also helped in eliminating false positives. It is concluded

that cholecystosonography should be attempted in cases where conventional radiographic examinations of the gallbladder fail to provide diagnostic information. In patients in whom the gallbladder can be identified, an overall diagnostic accuracy of 80% can be expected in the diagnosis of gallstones.

9229 ^{99m}TC-TETRACYCLINE AS A KIDNEY AND GALLBLADDER IMAGING AGENT. *(E.)* Fliegel, C. P.; Dewanjee, M. K.; Holman, L. B.; Davis, M. A.; Treves, S. (Harvard Medical Sch., Boston, Mass.). *Radiology* 110(2):407-412, 1974.

To evaluate ^{99m}Tc-tetracycline as a potential imaging agent in the kidney and gallbladder, the toxicity, biological distribution, and kinetics of this radiopharmaceutical were studied in male mongrel and beagle dogs and in New Zealand rabbits. The animals were anesthetized and given an i.v. dose (5-50 μCi) of the agent. Blood and urine samples were obtained using indwelling catheters, and the animals were sacrificed 1-24 hr after injection. The intrarenal and gallbladder distribution of ^{99m}Tc-tetracycline was studied by autoradiography; i.v. cholecystokinin (2 U/kg) was used to stimulate contraction of the gallbladder during imaging of this organ. In the toxicity studies, rabbits were injected with a single i.v. dose (40 mg) of the compound or were given a total of 200 mg in ten doses over a two-wk period. The blood disappearance rate of the radiopharmaceutical showed a fast component with a $T_{1/2}$ of 22 min (85% of the injected dose) in the rabbits and 35 min (52% of the injected dose) in the dogs, and a slow component with a $T_{1/2}$ of ten hr (15% of the injected dose) in the rabbits and 11 hr (27% of the injected dose) in the dogs. The rate of urinary excretion was 28.5% of the injected activity at five hr in the dogs and 65% at four hr in the rabbits. On a per gram basis, the kidney uptake in the rabbit at two hr was ten times higher than that of the blood; the liver concentration was similar to that in the blood; and the gallbladder concentration was four-fold greater than that in the blood. The activity recovered from the small intestine and from the skeleton was low. Uptake by the renal cortex was 15 times higher than the uptake by the renal medulla, and the urinary activity was three times higher than the renal cortical activity. Most of the Tc was still bound to the tetracycline. Similar results were obtained in the dogs. Excellent static and dynamic images of the kidneys and gallbladder were obtained in both species. Neither the acute nor the subacute toxicity studies revealed pathological changes related to the radiopharmaceutical. These results encourage clinical trials of ^{99m}Tc-tetracycline as a renal and gallbladder imaging agent in humans.

9230 THE LOW-FAT MEAL IN GALLBLADDER EXAMINATIONS. *(E.)* Mauthe, H. (Saint Agnes Hosp., Fond du Lac, Wisc.). *Radiology* 112(1):5-7, 1974.

The effects of fatty food ingestion on x-ray visualization of the gallbladder were determined in radiographic examinations. Some of the patients (479) had received a low-fat meal or no food at all on the preceeding evening, and 584 patients had consumed a "regular diet" hospital meal or their own regular meal at home. Each patient was given one Telepaque pill per 20 lb of body weight within 2-3 hr after the evening meal. In addition, 64% of the patients received three Dulcolax tablets at bedtime, and some patients were given fat-free meals in the morning prior to examination. The rate of satisfactory visualization on the first examination was 77% for the "low-fat meal" group and 81.4% for the "regular diet" group. On repeat examination, 6.2% of the gallbladders in the regular diet group and 10.9% of those in the low-fat group failed to show up. When all patients whose gallbladders could not be seen on either examination were eliminated from consideration, the results showed that 88.3% of the patients on a "regular diet" could be expected to show adequate results on the first examination; if a low-fat meal is given on the previous evening, a visualization rate of 86.6% can be expected. Dulcolax did not interfere with visualization and may even have enhanced it. The data indicate that there is no merit in prescribing a special low-fat meal on the evening before gallbladder examination.

9231 ELEVATED CARCINOEMBRYONIC ANTIGEN LEVELS AND BILIARY TRACT OBSTRUCTION. *(E.)* Lurie, B. B.; Loewenstein, M. S.; Zamcheck, N. (Boston City Hosp., Boston, Mass. 02118). *JAMA* 233(4):326-330, 1975.

Circulating carcinoembryonic antigen (CEA) levels and their relation to liver function test values were studied in 29 jaundiced patients (20 men, 9 women) with benign extrahepatic biliary tract obstruction and inflammation. Serial liver function tests included SGOT, serum bilirubin and alkaline phosphatase level assay. CEA levels were greater than 2.5 ng/ml for 15 (52%) patients: ten patients had values between 2.5 and 5.0 ng/ml and five patients had values between 5.0 and 10.0 ng/ml. Elevated CEA levels were associated more frequently with common bile duct stones only (5 of 7 patients) than with gallbladder stones alone (3 of 9 patients); this difference was not statistically significant. The highest CEA levels were found in two patients with liver abscesses; these levels returned to normal in seven of ten patients following relief of obstruction, and increased in two patients who had progressive inflammation. Serum alkaline phosphatase and bilirubin levels were higher in the patients with elevated CEA levels (563 *vs* 254 IU, resp., and 7.2 *vs* 3.7 mg/100 ml, resp.) than other patients. Serum alkaline phosphatase levels showed a positive correlation with CEA levels. It is concluded that patients with obstructive jaundice and elevated CEA levels do not necessarily have cancer. Benign extrahepatic biliary tract obstruction and inflammation can cause elevated CEA levels which return to normal when these factors are eliminated.

9232 CALCIUM IN LIMY BILE AND GALLSTONES. *(Ger.)* Wosiewitz, U.; Wolpers, C. (Institut Medizinische Physik, Universitat, D-4400 Munster, Hufferstr. 68, Germany). *Leber Magen Darm* 5(1):3-12, 1975.

Comparisons were made of radiological findings before and after surgery on gallstones from 542 patients. Patients with negative cholecystograms, with the "Mercedes" sign (gas-containing gallstones), and porcelain gallbladder were not included. Of the 542 patients studied, 32.1% had solitary and 56.4%, multiple cholesterol gallstones; 11.5% had pigment stones. No Ca was found in 63.8% of the gallstones preoperatively or in 51.2% postoperatively. Postoperative X-ray examination showed that Ca-opaque structures were least common (39.9%) in multiple cholesterol gallstones and were most common (79.1%) in pigment stones; these structures were present in 53.2% of solitary cholesterol stones. X-ray diffraction analysis, IR spectroscopy, and X-ray fluorescence analysis were used to examine Ca-containing stones from 26 patients, limy bile from three, and Ca-free stones from six. Samples of limy bile contained $CaCO_3$ present as vaterite and/or calcite (microliths) when fresh, and as aragonite (rod-shaped structures) when stored for long periods. Stones with Ca in the center always consisted of calcium bilirubinate and generally contained small amounts of Ca. In solitary or multiple cholesterol stones, large amounts of $CaCO_3$ (82%) were found as calcite, aragonite, or vaterite in ring- or saucer-shaped structures; vaterite was the most common form encountered (62%). $CaCO_3$ was present in a radial pattern in some solitary cholesterol stones and in one patient with multiple colesterol stones. In two patients who had solitary cholesterol stones wedged in the cystic duct, Ca deposits were present on only one side of the stones as deposits of aragonite with a pronounced crystalline texture. In three faceted stones, Ca was present in thin, rosette-like structures as the palmitate. *In vitro* experiments demonstrated that porous stones of cholesterol and Ca salts and stones with partially formed scales of $CaCO_3$ dissolved readily in diethyl ether, leaving behind skeletons or a fine, powdery residue.

9233 KINETICS AND POOL SIZE OF CHENODEOXYCHOLIC ACID IN CHOLESTEROL GALLSTONE PATIENTS. *(E.)* Pedersen, L.; Arnfred, T. (Depts. Medicine and Clinical Chemistry, Aalborg Sygehus Nord, Aalborg, Denmark). *Scand. J. Gastroenterol.* 10(5):557-560, 1975.

The kinetics, half-life, pool size, and daily production rate of chenodeoxycholic acid (CDCA) were examined by isotope dilution in untreated gallstone patients and compared to healthy controls in order to determine the specific role of CDCA in the pathogenesis of gallstones. Seven patients with radiolucent gallstones in functioning gallbladders and nine healthy controls were injected i.v. with 10 μCi of 24-^{14}C-CDCA. Bile was recovered by duodenal intubation. The CDCA percentage of total bile acids (TBA) and the TBA pool size were calculated. The pool size and daily production rate of CDCA were decreased in the gallstone patients; the results were not significant. The CDCA half-life was similar in both groups. The CDCA percentage of TBA was significantly higher in the patients (49 ± 10%) than in the controls (39 ± 7%). The TBA pool size was significantly reduced in gallstone patients (1073 ± 391 mg *vs* 1822 ± 511 mg for the controls). It was concluded that the CDCA and cholic acid metabolic pathways are similar in gallstone patients and that gallstone formation is not due to specific alterations in CDCA metabolism. The significance of increased CDCA percentage in bile was also discussed. It was suggested that a relative increase in the bile content of dihydroxy bile acids may lead to a reduced cholesterol holding capacity of bile, thus favoring the formation of gallstones.

9234 THE EFFECT OF CHENODEOXYCHOLIC ACID FEEDING ON BILE ACID KINETICS AND FECAL NEUTRAL STEROID EXCRETION IN PATIENTS WITH HYPERLIPOPROTEINEMIA TYPES II AND IV. *(E.)* Kallner, M. (Dept. Medicine, Serafimerlasarettet, Stockholm, Sweden). *J. Lab. Clin. Med.* 86(4):595-604, 1975.

The turnover of 24-^{14}C-cholic acid and ^{3}H-chenodeoxycholic acid and the excretion of cholesterol fecal neutral steriods were studied before and during p.o. administration of chenodeoxycholic acid to patients with hyperlipoproteinemia. Chenodeoxycholic acid (0.8-1.0 g/day) was administered to six patients with type II and to seven patients with type IV lipoprotein pattern. During treatment the chenodeoxycholic acid pool size increased in all subjects (not studied in one type IV patient), and in type II patients was associated with a decrease in the cholic acid pool size (868 ± 141 mg to 213 ± 51 mg) and synthesis rate (204 ± 36 mg/day to 54 ± 20 mg/day). The cholic acid pool size decreased in six of the seven patients with type IV hyperlipoproteinemia; all subjects showed a decrease in cholic acid synthesis (607 ± 155 mg/day to 202 ± 44 mg/day). The difference encountered in cholic acid synthesis suggests that the feedback regulation of cholic acid formation might be hypersensitive in type II and/or insensitive in type IV. Chenodeoxycholic acid feeding had no consistent effect on the fecal excretion of cholesterol, coprostanol, and coprostanone.

9235 DISSOLVING GALLSTONES IN VIVO: THE EFFECT OF CHENODEOXYCHOLIC ACID ON GALLSTONES, THE LITHOGENICITY OF BILE, AND SERUM LIPIDS IN MAN. *(Ger.)* Fromm, H.; Eschler, A.; Tollner, D.; Canzler, H.; Schmidt, F. W. (Medizinische Hochschule, 3 Hannover-Kleefeld, Karl-Wiechert-Allee 9, Germany). *Dtsch. Med. Wochenschr.* 100(32):1619-1624, 1975.

Chenodeoxycholic acid (CDCA; 20 mg/kg/day) was administered for an average of 15 months to 14 patients (8 women and 6 men, aged 32-76 yr; mean age 52 yr) with radiologically diagnosed cholelithiasis who had refused surgery. All but one of the patients had multiple nonradiolucent gallstones; the remaining patient had a solitary calcified stone. In two patients, the gallstones dissolved completely after 12 and 15 months of therapy, resp., and the size of the stones decreased in four others. No changes occurred in the remaining eight patients. One patient developed a perforated gallbladder during therapy. Upper abdominal discomfort disappeared during therapy in two patients and improved in

nine. In general, CDCA was well tolerated. The only side effect was mild intermittent diarrhea which occurred in five patients. Bile was supersaturated with cholesterol in five of seven patients tested; the bile lipid composition normalized during CDCA therapy in all five patients. Serum triglyceride levels decreased during administration of CDCA in 10 of 11 patients tested, with the greatest decreases occurring in five patients with hypertriglyceridemia. This decrease in serum triglyceride levels was associated with a decrease in the pre-β-lipoprotein and chylomicron fractions. No significant change occurred in serum cholesterol levels.

9236 HEPATIC CHOLESTEROL METABOLISM IN PATIENTS WITH GALLSTONES. *(E.)* Salen, G.; Nicolau, G.; Shefer, S.; Mosbach, E. H. (East Orange VA Hosp., N. J.). *Gastroenterology* 69(3):676-684, 1975.

By determining the hepatic activities of 3-hydroxy-3-methylglutaryl-CoA (HMG-CoA) reductase and cholesterol 7α-hydroxylase, the relative rates of cholesterol and bile acid synthesis were estimated in 12 patients with cholesterol gallstones and 5 patients with extrahepatic biliary obstruction caused by carcinomas of the head of the pancreas or pancreatic pseudocysts. Similar measurements were performed on 6 patients with chronic duodenal ulcer and 3 patients in whom no diagnosis could be established; these controls had no evidence of lipid or liver abnormalities. In each case, enzyme activity and liver total cholesterol and microsomal free cholesterol determinations were performed on hepatic biopsy specimens. The mean hepatic HMG-CoA reductase activity was 27% greater in patients with gallstones and 75% lower in those with extrahepatic biliary obstruction than in the controls. These findings were not reflected in the plasma cholesterol levels, which were highest in the subjects with biliary obstruction. The activity of hepatic cholesterol 7α-hydroxylase was only 1/2 of control values in patients with gallstones and was also severely depressed in patients with extrahepatic biliary obstruction. The hepatic cholesterol concentration was 56% higher in the gallstone patients than in the controls. It was also elevated in 2 of the patients with extrahepatic biliary obstruction, but there was a wide variation in hepatic cholesterol concentration in this group. The cholesterol concentrations in the isolated microsomes of the gallstone and control groups were similar. The data suggest that the development of gallstones is related both to increased cholesterol synthesis and to decreased bile acid formation, whereas cholesterol accumulates in biliary obstruction because of defective removal.

9237 CHOLESTATIC JAUNDICE FOLLOWING INGESTION OF THE LAXATIVE, NORMOLAXOL. *(Ger.)* Trulzsch, D.; Klinge, O.; Zilly, W.; Richter, E. (Medizinische Klinik, Universitat Wurzburg, 87 Wurzburg, Josef-Schneider-Strasse 2, Germany). *Med. Klin.* 70(17):771-774, 1975.

Case reports are presented for two women, aged 28 and 34 yr, who developed cholestatic jaundice after taking Normolaxol (4,4'[2-quinolylmethylene]diphenol hydrochloride) for 23 and 14 days, resp. This laxative is structurally similar to bisacodyl and is related to oxyphenisatin. The first patient, who had been taking antacids for chronic gastritis for about three yr, needed laxatives to correct the resulting constipation. In addition to Normolaxol, she had been taking an oral contraceptive, Stediril-D, for six wk before hospitalization with jaundice, anorexia, and pruritis. The second patient, who apparently had viral hepatitis as a child, presented with nausea, vomiting, a fever of 40 C, and jaundice. In both cases, viral hepatitis was ruled out by liver biopsies which showed: edema of the hepatic triads; swelling of the hepatic epithelium in the inner parts of the lobules; concentration of basophilic ergastoplasm at the peribiliary pole of the cells; intracellular drops of bile and bile cylinders; and some reparative mitotic figures. No radiological evidence of extrahepatic biliary obstruction was found in either patient. The cause of this cholestatic jaundice was confirmed to be Normolaxol in the first patient since she developed a recurrence of jaundice two days after administration of 2 teaspoons of the laxative. Although the second patient received no drugs after hospitalization, serum bilirubin and transaminase values took five wk to return to normal.

9238 INFLUENCE OF PHENOBARBITAL ON BILE COMPOSITION IN EPILEPTIC PATIENTS. *(E.)* Capron, J. P.; Dumont, M.; Dairou, R.; Erlinger, S. (Hopital Beaujon, 100, boulevard du General Leclerc, 92100 Clichy, France). *Biomedicine* 23(5):176-179, 1975.

The effect of phenobarbital on bile composition was studied in 13 epileptic patients (5 women and 8 men) who had been taking the drug (0.05-0.3 g/day) for an average of 11 yr. Fourteen subjects without liver disease, who were not receiving any drugs, served as controls. A single lumen duodenal tube was placed in the second part of the duodenum in the fasted subjects, and cholecystokinin (40 Ivy units, i.v.) was administered. The gallbladder bile was collected by aspiration and its bile salt, phospholipid, and cholesterol concentrations were determined. There was no significant difference in relative bile composition between the phenobarbital-treated subjects and controls, and there was no apparent relation between the dose and duration of drug treatment and the relative bile composition. The bile acid plus phospholipid:cholesterol ratio also did not differ between the two groups. Four of the phenobarbital-treated subjects and eight of the control had saturated or supersaturated bile. The results indicate that phenobarbital treatment does not produce detectable modifications in bile composition. They also give no indication that phenobarbital may be useful in the treatment of cholesterol gallstones.

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See also, 8264, 8422, 8423, 8424, 8444, 8460, 8462, 8477, 8571, 8588, 8619, 8646, 8656, 8692, 8821, 8864, 8899, 8917, 8922, 8938, 8944, 8965, 8968, 9023, 9034, 9354, 9370.

GENERAL

9308 GASTRIC pH AND MICROFLORA OF NORMAL AND DIARRHOEIC INFANTS. *(E.)* Maffei, H. V. L.; Nobrega, F. J. (Faculty Medical Biological Sciences, Botucatu, Sao Paulo, Brazil). *Gut* 16(9):719-726, 1975.

The microflora and pH of gastric contents were determined in four groups of 14 infants (aged 1-12 months): breast-fed normal controls, bottle-fed normal controls, well-nourished infants with acute diarrhea; and infants with chronic diarrhea and protein-calorie malnutrition. Twelve infants in the fourth group were reevaluated after recovery from diarrhea and malnutrition. A bactericidal effect of pH below 2.5 was observed in all groups. Bottle-fed controls had low pH values (below 4.0) and low bacterial concentrations (below 4.00[$\log_{10}$]/-ml), whereas infants with chronic diarrhea and protein-calorie malnutrition had high pH values and bacterial overgrowth, especially of Gram-negative bacilli (Enterobacteriaeceae and Pseudomoneaceae). After recovery, the only remaining alteration was the frequent isolation of yeast-like fungi, including *Candida albicans*, in low concentrations. Except for a greater frequency of isolation of yeast-like fungi compared with controls, infants with acute diarrhea presented no alterations; this indicated that pH alterations and Gram-negative bacilli overgrowth occurred during the evolution of the disease to the chronic state. Breast-fed normal infants had pH concentrations similar to those of the chronic diarrhea group but without Gram-negative bacilli overgrowth, suggesting that factors other than pH regulate bacterial overgrowth in the gastric contents of infants with chronic diarrhea.

9309 THE AGGLUTINATING ANTIBODY RESPONSE IN THE DUODENUM IN INFANTS WITH ENTEROPATHIC E. coli GASTROENTERITIS. *(E.)* McNeish, A. S.; Evans, N.; Gaze, H.; Rogers, K. B. (Inst. Child Health, Univ. Birmingham, Francis Rd., Birmingham B16 8ET, England). *Gut* 16(9):727-731, 1975.

The agglutinating antibody responses in duodenal fluid and serum were measured serially in 15 infants (aged 5 weeks to 15 months) with enteropathogenic *Escherichia coli*. All infants presented with acute diarrhea and vomiting of one to five days duration. Duodenal fluid from each infant was incubated at 37 C for one hr with monospecific sheep antihuman immunoglobulin (Ig) G, IgA, and IgM antisera. The antisera were of known antigen-binding capacity; a reduction in bacterial agglutination titer of two dilutions or more in the supernatant indicated the presence of agglutinating antibody of the appropriate Ig class. Peak levels of duodenal agglutinins were recorded eight to 18 days after the onset of symptoms, and the titers fell within the next seven to 14 days. IgA antibodies were detected in all patients at some stage. IgM antibodies were detected early in the response in five patients and appeared to be the predominant antibodies in two. IgG antibodies were found in two patients. Eight children had agglutinating antibodies in their sera, but serum titers did not correlate with intestinal titers. No agglutinin response was detected in six children. Further studies are required to determine whether the differences in intestinal and serum responses are host-derived or whether they reflect different pathogenic properties of the infecting organism.

9310 MORPHOLOGICAL FEATURES IN A NEUTRAL LIPID STORAGE DISEASE. *(E.)* Slavin, G.; Wills, E. J.; Richmond, J. E.; Chanarin, I.; Andrews, T.; Stewart, G. (Northwick Park Hosp. and Clinical Res. Center, Harrow, Middlesex, England). *J. Clin. Pathol.* 28(9):701-710, 1975.

The morphological changes in a 22-yr-old Ugandan Asian woman with a generalized storage disease characterized by the intracellular deposition of neutral lipid are described. Biopsy specimens of bone marrow, jejunum, stomach, rectum, liver, endometrium, vastus lateralis muscle, and skin were examined by light microscopy, and specimens of bone marrow, stomach, rectum, skin, liver, and peripheral blood buffy coat were examined by electron microscopy. Lipid vacuolation was present in the sternal marrow granulocytes and monocytes, the columnar epithelial cells of the jejunal mucosa, the glandular cells from the body of the stomach, the epithelial cells of the rectal mucosa, the liver parenchymal cells, the stromal cells of the endometrial curettings, the vastus lateralis muscle, and the cells of the stratum basale of the skin. Foamy macrophages were observed in the jejunal and stomach specimens and the skin biopsy showed an ichthyosiform reaction which did not conform to any of the classical forms of ichthyosis. Lipid histochemistry indicated that the lipids present in the various tissues were neutral fat, largely triglyceride but with a very minor component of cholesteryl esters. The peripheral blood lymphocytes showed a normal female karyotype with no evidence of mosaicism. Electron microscopy confirmed the histological distribution of lipid and also demonstrated the presence of lipid droplets in the peripheral blood erythroblasts, reticulocytes, and occasional lymphocytes. In addition, lipid droplets were identified in the nuclei of some liver parenchymal cells, although they were not observed in any of the membrane-bound organelles. In the liver, lipid droplets were sometimes partially surrounded by mitochondria. Biochemical abnormalities included an elevation in the neutral triglyceride content of the peripheral blood granulocytes, a marked elevation of the B-peptide in low density lipoprotein, a reduction of the A-peptide in high density lipoprotein, increased incorporation of palmitate 1-^{14}C into triglyceride, and elevations in serum aspartate transaminase and creatine phosphokinase. The biochemical basis of the storage disorder in this patient is uncertain; the primary defect appeared to be intrinsic to the cell and may have involved either a defective cytoplasmic lipase or an impaired uptake and utilization of fatty acids by the mitochondria.

9311 ACUTE REVERSIBLE LUPUS VASCULITIS OF THE GASTROINTESTINAL TRACT. *(E.)* Shapeero, L. G.; Myers, A.; Oberkircher, P.E.; Miller, W. T. (Hosp. Univ. Pennsylvania, Philadelphia). *Radiology* 112(3): 569-574, 1974.

The records of 141 patients who had been diagnosed as having systemic lupus erythematosus during a 20 yr period were reviewed to identify those with gastrointestinal vasculitis. Abdominal symptoms which required medical therapy were present in 68 cases: 20 of the 68 had clinical signs of gastrointestinal arteritis, and 9 of these had radiographic findings consistent with some degree of ischemia. These included 4 with changes in the jejunal mucosa and 5 with radiographic evidence of gastric atony, duodenal stasis, or gastric pseudo-obstruction. The remaining 11 patients had normal radiographs or mild adynamic ileus. The most common symptoms in these 20 patients, in decreasing order of incidence, were anorexia, pain, postprandial fullness, nausea, and vomiting. In addition, 6 patients had diarrhea and 4 had evidence of gastrointestinal bleeding. The most frequently encountered clinical signs were abdominal tenderness with localized rebound and guarding; 65% of the patients were anemic and 95% had positive lupus erythematosus preparations. Most patients were afebrile and had normal WBC and normoactive bowel sounds. Since all of these patients improved with steroid therapy, and surgery proved unnecessary, pathological confirmation of vasculitis could not be obtained. Four typical case reports are presented. These findings suggest that gastrointestinal lupus vasculitis is more common than is generally recognized. While symptoms alone are not of great value in identifying patients with vasculitis, careful evaluation of abdominal plain radiographs or gastrointestinal series during a symptomatic period may be useful in establishing the diagnosis. Early recognition of

gastrointestinal lupus vasculitis is important since the ischemia is often reversible with steroid therapy.

9312 LOWER ESOPHAGEAL SPHINCTER RESPONSES TO ENTERIC HORMONES IN TWO PATIENTS WITH ZOLLINGER-ELLISON SYNDROME. *(E.)* Wu, W. C.; Hogan, W. J.; Whalen, G. E.; Hoke, S. E.; Go, V. L. W.; Kalhoff, R. K. (Veterans Admin. Center, Wood [Milwaukee], Wisconsin). *Am. J. Dig. Dis.* 20(8):716-720, 1975.

This report describes two patients with proven Zollinger-Ellison Syndrome (ZES) in whom lower esophageal sphincter (LES) response to exogenous gastrin and other enteric hormones was determined. In case one (a 40-yr-old woman), peptic ulcer was demonstrated on roentgen examination. Selective celiac arteriography showed a "tumor blush" in the tail of pancreas, consistent with an islet cell neoplasm. Fasting serum gastrin level was 390 pg/ml. A total gastric resection and distal pancreatectomy were performed. Histologic examination of the resected pancreas confirmed an islet cell carcinoma. In case two (a 43-yr-old man with a 2-yr history of symptomatic peptic ulcer disease), vagotomy, antrectomy and gastrojejunostomy were performed for "intractable" ulcer pain. Several months later, abdominal pain recurred and a marginal ulcer was discovered at gastroscopy. Additional stomach was resected and a gastroduodenostomy and repeat vagotomy were performed. The patient did well postoperatively. Two months later, however, multiple serum gastrin determinations ranged between 300 and 900 pg/ml. Duodenoscopy revealed a duodenal wall tumor. At operation, the duodenal wall tumor (islet cell tumor) was resected and a total gastrectomy was performed. Serum gastrin was 62 pg/ml following the operation. Prior to their total gastrectomy, esophageal manometry was performed in both patients after an overnight fast. After localization of the LES by the conventional pull-through method, the three radial tips were secured within the sphincter at the position recording peak LES pressure. Glucagon was given i.v. in pulse doses of 1.0 and 10.0 µg, while pentagastrin was given as pulse doses of 2 and 4 µg/kg. An interval of 20 min separated each dose in both drug regimens. Secretin, 0.5 U/kg, i.v., was administered to the second patient. Serum for glucagon and gastrin determinations was drawn immediately prior to hormone injections and at 2, 5, 15 and 20 min. Glucagon and secretin, in dosages which decrease LES pressure in normal subjects only during LES stimulation by exogenous gastrin, caused a decrease in resting LES pressure in the ZES patients. This drop in LES tone occurred both during concomitant serum gastrin rise caused by secretin and during gastrin serum decline caused by glucagon. This finding suggests that the action of secretin on LES pressure may be independent of endogenous gastrin, while the glucagon effect on LES tone may be mediated through gastrin.

9313 ASCITES REINFUSION USING THE RHODIASCIT APPARATUS--CLINICAL EXPERIENCE AND COAGULATION ABNORMALITIES. *(E.)* Wilkinson, S. P.; Davidson, A. R.; Henderson, J.; Williams, R. (King's Coll. Hosp., London, S.E.5, England). *Postgrad. Med. J.* 51(598):583-587, 1975.

The Rhodiascit ascites reinfusion technique was used in the management of ascites in 20 patients (aged 23-65 yr) on 24 occasions. The procedure was used in these patients because of diuretic-resistant ascites with spontaneous functional renal failure (5 patients), diuretic-induced uremia (2), Budd-Chiari syndrome (2), to accelerate discharge from hospital for socioeconomic reasons (10), and for one patient with cirrhosis and non-functioning kidneys on maintenance hemodialysis who had recently developed ascites. The procedure was not of value in aiding patients with functional renal failure. Although ascites was partly relieved, all these patients died within two wk of recirculation. In the two cases of diuretic-induced uremia, a rapid improvement in renal function resulted from the reinfusion and encephalopathy also improved. Ascites was controlled afterward by lower doses of diuretics. The two patients with Budd-Chiari syndrome responded initially, but were later readmitted with reaccumulation of ascites and a deterioration in liver function. A second reinfusion was carried out in each case, but both patients died of hepatic failure within a week of the procedure. In ten patients who had good renal function, but marked ascites, conventional diurectic therapy would have taken two to three months to relieve the ascites, whereas use of the reinfusion procedure enabled all ten to be discharged within two wks of the reinfusion. In the one case of chronic renal failure, there was no other means of controlling ascites. He is being reinfused at three-month intervals. The uremia is well controlled on hemodialysis. Complications during the procedure were few. On six occasions body temperature rose by more than 1 C. A fall in plasma sodium concentration by more than 5 mEq/l was noted in four cases. It was noted that the plasma prothrombin time always became prolonged following six hr of the Rhodiascit procedure. Plasma fibrinogen concentrations also fell. Plasma levels of factors V, VII, and IX fell as well with mean reductions of 15%, 36%, and 19%, resp. The most likely cause of the abnormal blood coagulation tests was deposition of fibrin onto the filtration membrane. It is suggested that this procedure not be used in any patient with a recent history of bleeding or in patients with markedly abnormal tests of coagulation.

9314 A PROSPECTIVE COMPARATIVE TRIAL BETWEEN EARLY ENDOSCOPY AND RADIOLOGY IN ACUTE UPPER GASTROINTESTINAL HAEMORRHAGE. *(E.)* McGinn, F. P.; Guyer, P. B.; Wilken, B. J.; Steer, H. W. (Southampton Univ. Hosp., Southampton, England). *Gut* 16(9):707-713, 1975.

A prospective comparative trial is reported between the results of early endoscopy and barium meal examinations in 150 patients admitted with acute upper gastrointestinal hemorrhage. Of these patients, 138 underwent both investigations within 24 hr of admission. Emergency endoscopy accurately identified the source of hemorrhage in 86% of the patients; emergency radiology identified the source in 51%. All 19 patients bleeding from an esophageal source were identified endoscopically, whereas radiology detected the lesion in only three patients with varices. Gastric sources of hemorrhage were identified by endoscopy in 47 cases (92%) and by radiology

in 23 cases (45%). Endoscopy identified a duodenal source of hemorrhage in 52 of 56 patients (93%) and radiology in 45 patients (80%). Misleading positive reports were given endoscopically in two patients and by barium meal in 11. Both misleading endoscopic reports were of hemorrhage from erosive gastritis in patients shown to have gastric ulceration on barium meal examination. Five of eight patients with radiological reports of duodenal ulceration had no evidence of active duodenal ulceration at endoscopy; three had other lesions that were causing hemorrhage. Three patients were reported radiologically to have a gastric ulcer, gastric carcinoma, and duodenal deformity, resp. In all three cases, endoscopy identified the source of the bleeding as Mallory-Weiss tears. The identification of the source of hemorrhage was possible in 126 patients (91%) by the use of both methods. While emergency endoscopy is superior to emergency barium meal examinations, the examinations are complementary and both should be used for patients with acute upper gastrointestinal hemorrhage.

9315 RADIOLOGICAL MANIFESTATION OF RADIATION-INDUCED INJURY TO THE NORMAL UPPER GASTROINTESTINAL TRACT. *(E.)* Goldstein, H. M.; Rogers, L. F.; Fletcher, G. H.; Dodd, G. D. (Univ. Texas System Cancer Center, Houston, Tex.). *Radiology* 117(1):135-140, 1975.

Radiation-induced injury to the esophagus, stomach and duodenum was studied in patients with bronchogenic, metastatic breast, cervical or testicular carcinomas, who had received high mediastinal or para-aortic lymph node irradiation to an average dose of 5,000 rads. Radiation esophagitis, characterized by dysphagia or substernal burning sensation, occurred in 30 patients following high dose (4,500-6,000 rads) mediastinal irradiation. Among these patients, the commonest radiologic finding was esophageal motor dysfunction. Morphological abnormalities such as stricture, angulation and ulceration occurred less frequently. Patients (52 men, 121 women) receiving 4,000 to 5,000 rads to the high para-aortic or right upper retroperitoneal area over a period of five wk usually developed radiation-induced gastroduodenitis, with or without frank ulceration. Radiation injury of the duodenum was most apparent in the second portion and varied from large ulcerations to smooth strictures; diffuse thickening of the mucosal pattern was also encountered. No significant healing occurred over an eight month period despite intensive therapy. When treatment was administered in a split course, as in testicular carcinoma, radiation injury to the upper gastrointestinal tract occurred less frequently. It is concluded that factors important in the pathogenesis of radiation gastroduodenitis are related to dose-time relation of irradiation as well as individual susceptibility. Pertinent clinical features, pathogenesis, and pathological correlations are also discussed.

9316 GASTROINTESTINAL COMPLICATIONS FOLLOWING RENAL TRANSPLANTATION. *(E.)* Julien, P. J.; Goldberg, H. I.; Margulis, A. R.; Belzer, F. O. (Univ. California Sch. Medicine, San Francisco, Calif.). *Radiology* 117(1):37-44, 1975.

Gastrointestinal complications developing in 29 (6%) of 510 patients following renal transplantation are described. Special attention was paid to the time of onset of the complications, the type of immunosuppressive therapy, clinical and radiological findings and diagnosis. Of these patients, 13 (45%) died as a result of complications. Gastrointestinal bleeding, usually considered the most common complication, was observed in only seven cases. Other complications include the following: upper gastrointestinal ulcers (9 patients); pancreatitis and hyperamylasemia (5 patients); massive ileus (29); fistulas and abscesses (4); bowel infraction (3); small bowel obstruction (2); gangrenous cholecystitis (2); diffuse esophagitis (2); spontaneous perforation of the sigmoid colon, producing fever, chills and feculent drainage from the transplantation lesion (1); and pneumatosis cystoides intestinales (3). Six patients had no clinical or laboratory findings suggesting gastrointestinal complications; radiological examinations detected the problem. The extremely high mortality rate among patients suffering from gastrointestinal complications following renal transplantation suggest immediate diagnosis and therapy as a preventive measure. When steroids or immunosuppressive therapy mask clinical symptoms of abdominal disease, radiography may be the prime diagnostic method.

9317 THE ROLE OF THE ENTEROHEPATIC CIRCULATION OF UREA NITROGEN IN HEPATIC ALBUMIN SYNTHESIS IN MAN [abstract]. *(E.)* Tavill, A. S.; Varcoe, R.; Halliday, D.; Richards, P.; Carson, E. R. (MCR Clin. Res. Centre, Harrow, Middlesex, England). *Gut* 16(5):399, 1975.

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9363 GENETIC CONTROL OF THE CAPACITY OF Sh. flexneri TO PRODUCE A LETHAL ACTION ON MACROPHAGES. REPORT I: A STUDY OF A POSSIBLE EXTRACHROMOSOMAL NATURE OF CYT+-DETERMINANT. *(Rus.)* Bondarenko, V. M.; Petrovskaya, V. G. (Gamaleya Inst. Epidemiology Microbiology, Acad. Medical Sciences USSR, Moscow, USSR). *Zh. Microbiol. Epidemiol. Immunobiol.* (2):19-24, 1975.

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9368 GASTROINTESTINAL BLEEDING. *(Ger.)* Anonymous. *Diagnostik* 8(2):41-42, 1975.

9369 ROENTGENOLOGICAL DATA ON THE MOTOR FUNCTION OF THE PHARYNX, ESOPHAGUS AND STOMACH IN PATIENTS WITH MYASTHENIA. *(Rus.)* Kuzin, M. I.; Smakov, G. M. (I. M. Sechenov 1st Moscow Medical Inst., USSR). *Klin. Med. (Mosk.)* 53(4):54-59, 1975.

9370 FOOD INTOLERANCE WITH ULCERATIVE COLITIS AND CHOLELITHIASIS. *(Ger.)* Classen, M.; Matzkies, F.; Dobe-Tauchert, P.; Deming, L. (Medizinischen Klinik mit Poliklinik, Univ. Erlangen-Nürnberg, Erlangen, Germany). *Inn. Med.* 1(1):7-12, 1974.

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9372 ILLNESSES OF THE DIGESTIVE TUBE HAVING A HEREDITARY PREDISPOSITION. *(Fr.)* Levrat, M.; Pirson, Y. (no affiliation given). *Bordeaux Med.* 8(7):767-775, 1975.

9373 DIARRHEA DUE TO PARENTERAL INFECTION IN CHILDREN. *(Fr.)* Boissiere, H. (Med. Hop. Perpetuel-Secours, Levallois, France). *Concours Med.* 97(11):1827-1828, 1831, 1833-1834, 1837-1838, 1841-1843, 1975.

9374 CLINICALLY TREATED HYPERTONIC PATIENTS WITH GASTROINTESTINAL DISEASES. *(Ger.)* Teichmann, G.; Worreschk, K.; Isensee, I.; Rosch, R.; Iredi, B.; Blumenthal-Barby, K. (Klinik fur Innere Medizin, 25 Rostock, Ernst-Heydemann-Strasse, Germany). *Z. Gesamte Inn. Med.* 30(10):372-375, 1975.

9375 PRIORITIES FOR PROTEIN SYNTHESIS IN PROTEIN CALORIE MALNUTRITION [abstract]. *(E.)* Olson, R. E.; Suskind, R.; Thanangkul, O.; Leitzmann, C.; Kulaporas, P.; Vithayasai, V.; Johnston, M. (Anemia and Malnutrition Research Center, Chiang Mai Univ., Chiang Mai, Thailand). *Clin. Res.* 23(3):459A, 1975.

9376 VASOACTIVE INTESTINAL POLYPEPTIDE: ELEVATED PLASMA AND TISSUE LEVELS IN THE WATERY-DIARRHEA SYNDROME DUE TO PANCREATIC AND OTHER TUMORS [abstract]. *(E.)* Said, S. I. (VA Hosp., Dallas, Texas). *Clin. Res.* 23(3):440A, 1975.

9377 TUMOR IMMUNOLOGY AND THE GUT. *(E.)* Calman, K. C. (Western Infirm., Glasgow, Scotland). *Gut* 16(6):490-499, 1975.

9378 BASAL SERUM GASTRIN VALUES IN NORMAL SUBJECTS AND THOSE WITH GASTROINTESTINAL AND ENDOCRINE DISEASE. *(It.)* Giordano, G.; Marugo, M. (Istituto Scientifico Medicina Interna, Universita Genova, Italy). *Boll. Soc. Ital. Biol. Sper.* 50(22): 1891-1897, 1974.

See also, 8093, 8096, 8398, 8414, 8416, 8421, 8430, 8459, 8461, 8463, 8533, 8546, 8555, 8608, 8632, 8687, 8727, 8761, 8767, 8787, 8800, 8808, 8825, 8863, 8942, 9148, 9278.

9379 CHAGASIC MEGAESOPHAGUS: SIMILARITY TO ACHALASIA BY MANOMETRICS, RADIOGRAPHY, AND RESPONSE TO PNEUMATIC DILATION. *(E.)* Raizman, R. E.; Neva, F. A.; Eckert, R. J.; Duffy, P. A.; Lipshutz, W. H. (Lab. Parasitic Diseases, Natl. Inst. Health, Bethesda, Md. 20014). *Am. J. Dig. Dis.* 20(9):882-888, 1975.

The clinical, cineradiographic, and manometric findings before and after pneumatic dilation in a 54-yr-old woman with Chagas' disease and symptomatic megaesophagus were reported. The patient presented with complaints of dysphagia, regurgitation of undigested food, and substernal discomfort upon swallowing. Initial cineradiographic examination revealed a dilated esophagus (5 cm), a prominent air fluid level at the aortic arch, and absence of peristalsis. The dilated esophagus was tapered distally at the gastroesophageal junction. Endoscopic evaluation revealed the free passage of the endoscope into the stomach; no lesions of the stomach were noted. Manometric studies prior to pneumatic dilation indicated an elevated lower esophageal sphincter (LES) pressure of 42.6 mm Hg (normal, 16.4 mm Hg), impaired LES relaxation upon deglutition of 51.7% of resting LES pressure (normal, 100%), and the absence of peristalsis of the entire esophagus. Bethanechol chloride (40 µg/kg, s.c.) produced spontaneous high-peaked esophageal waves, an elevated base-line esophageal tension, and an increase in LES pressure from 35.5 to 85.5 mm Hg. Pneumatic dilation was performed with a pneumatic dilator positioned so that the midpoint of the radiopaque balloon was placed at the diaphragmatic hiatus; the balloon was inflated for two min with 15 psi pressure. Manometric evaluation 24 hr after pneumatic dilation revealed a decrease in LES pressure to 8.3 mm Hg. The percent relaxation remained abnormal at 46.8% and the absence of esophageal peristalsis persisted. Cineradiographic evaluation at two and four weeks posttreatment showed free passage of barium from the esophagus to the stomach. Peristalsis remained impaired, but no tapering of the gastroesophageal junction was noted. Ten weeks after dilation, the patient reported considerable symptomatic improvement. These results suggest that the common pathway of chagasic megaesophagus and achalasia involves denervated esophageal smooth muscle, and that pneumatic dilation is useful in the treatment of symptomatic chagasic megaesophagus.

9380 HEMATOLOGICAL AND IMMUNOLOGICAL RESPONSES TO THE TAPEWORM Hymenolepis diminuta IN MAN. *(E.)* Turton, J. A.; Williamson, J. R.; Harris, W. G. (Laboratory Animals Center, Carshalton, Surrey, England). *Tropenmed. Parasitol.* 26(2):196-200, 1975.

Self-infections with *Hymenolepis diminuta* were carried out to study the hematological and immunological responses of man to tapeworm. Initially, two preliminary experiments were undertaken. In the first, 30 cysticercoids dissected from the beetle, *Tribolium confusum*, were ingested, and in the second, 100 cysts were taken 22 days later. After one year, a third exposure period of 47 days was studied; 200 cysts were ingested on each of five occasions, and followed by niclosamide 24 days after the first day of infection. Blood samples were taken before, during and post infection. RBC and total leukocyte counts were taken by Coulter counter, and PVC by microhematocrit. Leukocyte differentiation was performed by May-Grunwald-Giemsa stains and the plasma viscosity was measured. The IgG and IgM titer levels were measured by fluorescent antibody technique using monospecific anti-human fluorescein-labeled conjugates. Serum glutamate pyruvate transaminase and glutamic oxaloacetate transaminase levels were also determined. No significant changes in erythrocyte values, leukocyte differentiation, calorie intake, or weight change were observed in the three experiments. The third infection caused a pronounced elevation of the eosinophilia count ($500/cm^2$-$1,600/cm^2$) after 24 days. Plasma viscosity also increased from 1.60 cP to 1.74 after 20 days. IgG titer rose from 1:20 preinfection to 1:320 after 21 days. There was a definite but low increase in IgM titer to 1:20. There was no effect on serum glutamate pyruvate transaminase or glutamate oxaloacetate transaminase activities. Niclosamide was palatable with no side effects. The presence of specific IgM and IgG indicated an active infection, whereas IgG alone indicated only past exposure. Circulating IgE was not detected. There was no evidence of tissue damage.

9381 QUANTITATIVE DETERMINATION OF SPECIFIC IgE ANTIBODIES TO SCHISTOSOME ANTIGENS AND SERUM IgE LEVELS IN PATIENTS WITH SCHISTOSOMIASIS (S. mansoni OR S. haematobium). *(E.)* Dessaint, J. P.; Capron, M.; Bout, D.; Capron, A. (Pasteur Inst., Lille, France). *Clin. Exp. Immunol.* 20(3):427-436, 1975.

An immunosorbent technique was developed, and used to investigate immunoglobulin E (IgE) antibody response to schistosome infection, and its relation to overall serum IgE concentration, in patients with schistosomiasis and in persons with urinary bilharziasis. Samples of blood from two groups of patients were studied: 1) 156 patients with *Schistosoma mansoni* schistosomiasis; and 2) 21 patients with urinary bilharziasis. IgE levels of those in the first group were increased in 77.5%, 21.8% having concentrations over 5000 IU/ml. IgG levels were also elevated in 68.5%. No significant difference was observed in IgE concentration between patients with asymptomatic, intestinal or hepatosplenic bilharziasis. Significantly elevated IgE antibody levels were demonstrated in 24 of 34 patients. No correlation was observed with the clinical course of the infection or serological findings. Levels of IgE antibodies, however, correlated with overall serum IgE. Specific IgE antibodies were also demonstrated in 11 of 21 individuals with urinary bilharziasis. It is concluded that the significance of raised IgE levels requires further clarification, even though the pres-

ence of living parasites is a necessary requirement for IgE antibody production, as confirmed by the observation of a significant decrease of both IgE antibody and overall IgE levels after treatment.

9382 GUT PARASITES: ALTERED DEVELOPMENT CAUSED BY CHANGING THE HOST FROM ORAL TO PARENTERAL NUTRITION [abstract]. *(E.)* Castro, G. A.; Johnson, L. R.; Copeland, E. M.; Dudrick, S. J. (Univ. Texas Med. Sch., Houston, Texas). *Gastroenterology* 68(4):870, 1975.

9383 INTESTINAL ANISAKIASIS. FIRST CASE REPORT FROM NORTH AMERICA. *(E.)* Pinkus, G. S.; Coolidge, C.; Little, M. D. (Harvard Medical Sch., Boston, Mass. 02115). *Am. J. Med.* 59(1):114-120, 1975.

9384 A SURVEY OF INTESTINAL PARASITISM IN A COMMUNITY ON THE PAN AMERICAN HIGHWAY ROUTE IN EASTERN PANAMA (SUMMARY). *(Sp.)* Cutting, J. W. (Laboratorio Gorgas Memorial, Panama, Panama). *Bol. Of Sanit. Panam.* 79(1):30-36,

9385 CASE REPORT OF AN EARLY GASTRIC CARCINOMA WITH EGGS OF Schistosoma japonicum. *(Jpn.)* Shibata, H.; Morimatsu, M.; Hayashida, T.; Tanaka, Y. (2nd Dept. Pathology, Kurume Univ. School Medicine, Kurume, Japan). *Gan No Rinsho* 21(5):349-353, 1975.

9386 HYDATID DISEASE OF THE LIVER. STUDY OF 60 CONFIRMED CASES. PART I. CLINICAL, BIOCHEMICAL AND RADIOLOGICAL MANIFESTATIONS. *(Sp.)* Garcia Alvarez, J.; Reverte Cejudo, D.; Solis Herruzo, J. A.; Pena, P. (Hospital Clinico de San Carlos, Spain). *Rev. Clin. Esp.* 135(3):255-262, 1974.

9387 PARTICULARITIES OF PARASITIC LIVER CIRRHOSIS IN GUINEA PIGS IN EXPERIMENTAL OPISTHORCHOSIS. *(Rus.)* Glumov, V. Ya.; Glumova, V. A. (Dept. of Pathological Anatomy, Semipalatinsk Medical Inst., USSR). *Med. Parazitol. (Mosk.)* 43(3):289-293, 1974.

9388 FUNCTIONAL STATUS OF THE INTESTINE IN HYMENOLEPIDOSIS. *(Rus.)* Kramar, V. S.; Kedryavtseva, N. F.; Bykhovskaya, A. N.; Abidaeva, L. I.; Glebova, A. A. (Scientific Res. Laboratory of Proctology, Kuybyshev Medical Inst., USSR). *Med. Parazitol. (Mosk.)* 43(3):293-296, 1974.

9389 AMEBIASIS AND INCIDENCE OF Entamoeba histolytica CARRIERS IN AN ENDEMIC FOCUS IN THE ARMENIAN SSR. *(Rus.)* Sarkisyan, M. A.; Voskanyan, K. M.; Melkonyan, L. M. (A. B. Aleksanyan Inst. of Epidemiology, Virology and Medical Parasitology, Ministry of Public Health of the Armenian SSR, USSR). *Med. Parazitol. (Mosk.)* 43(6):650-653, 1974.

9390 EXPERIMENTAL STUDY OF THE NEW ANTIHELMINTHIC DRUG, JONITE. *(Rus.)* Chernyaeva, A. I. (E. I. Martsinovskiy Inst. of Medical Parasitology and Tropical Diseases, Ministry of Public Health of the USSR, Moscow, USSR). *Med. Parazitol. (Mosk.)* 43(3): 311-314, 1974.

9391 CURRENT PROBLEMS IN THE TREATMENT OF HELMINTHIASIS. *(Rus.)* Ozeretskovskaia, N. N. (E. I. Martsinovskii Inst. Medical Parasitology Tropical Medicine, Moscow, USSR). *Med. Parazitol. (Mosk.)* 46 (3):271-276, 1975.

9392 COMPARISON OF THE EFFECTS OF ANTIHELMINTHICS OF THE QUATERNARY AMMONIUM SALT TYPE ON BILE SECRETION AND THE CHEMICAL COMPOSITION OF THE BILE. *(Rus.)* Lychko, N. D. (E. I. Martsinovskii Medical Parasitology Tropical Medicine, Moscow, USSR). *Med. Parazitol. (Mosk.)* 46(3):307-310, 1975.

See also, 8103, 8448, 8955, 9032, 9033, 9042, 9043, 9052, 9292.

GENERAL

Regional Enteritis

9393 CROHN'S DISEASE OF THE APPENDIX PRESENTING AS ACUTE APPENDICITIS. REPORT OF 3 CASES WITH A REVIEW OF THE LITERATURE. *(E.)* Threatt, B.; Appelman, H. (Dept. Radiology, Univ. Michigan Hosp., Ann Arbor, Mich.). *Radiology* 110(2):313-317, 1974.

Three cases of Crohn's disease of the appendix are reported. A 21-yr-old white male presented with a six-month history of dull, vague, intermittent right lower quadrant pain which was relieved by defecation. The clinical and radiographic diagnosis was an appendiceal abscess. Exploratory celiotomy revealed a large mass surrounding the cecum in the region of the appendix, and the cecum and terminal ileum were removed *en bloc*. The appendiceal mucosa was ulcerated and the appendiceal wall was thickened by transmural inflammation extending into the serosa, subserosa, and the muscularis propria of the ileum and cecum; there was no mucosal involvement of the ileum or cecum. Granulomas were present in the wall of the appendix and in the regional lymph nodes.

The patient has remained asymptomatic during the three yr following intestinal resection. A 20-yr-old white female presented with a one-wk history of dull, nonradiating right lower quadrant pain relieved only by the knee-chest position. Spontaneous remission occurred, followed three wk later by recurrence with increased severity and nausea. Again, the clinical and radiographic findings suggested a diagnosis of appendiceal abscess. A right colectomy and distal ileal resection were performed. The appendiceal mucosa was extensively ulcerated with no involvement of the mucosa of the terminal ileum or cecum. The inflammatory reaction was identical to that in the first case. The patient has remained asymptomatic 34 months following surgery. A 26-yr-old white female presented with persistent, severe, diffuse abdominal pain of 3.5 wk duration. Laparotomy revealed a chronically inflamed appendix embedded within the cecal tip and adherent to the greater omentum, cecum, and terminal ileum. An appendectomy was performed. The proximally thickened appendix showed all microscopic features of Crohn's disease except granulomas. In this case, the appendiceal-cecal junction, which formed the resection margin, was involved. The patient has remained asymptomatic ten months following surgery. Although rare, Crohn's disease of the appendix should be considered in young patients who present with an acute abdomen and a radiographically demonstrable mass about the cecum and/or appendix.

9394 EXPERIMENTAL ANIMAL STUDIES OF THE ETIOLOGY AND PATHOGENESIS OF CROHN'S DISEASE. *(E.)* Cave, D. R.; Mitchell, D. N.; Brooke, B. N. (St. George's Hosp., London SW 17, England). *Gastroenterology* 69(3):618-624, 1975.

The etiology and pathogenesis of Crohn's disease were studied in 52 New Zealand White rabbits. The animals were inoculated intramurally into the intestine with a 100-μ filtrate of fresh ileum or colon homogenate or with 100-μ filtrate that was subsequently passed through a 0.2-μ filter. The homogenate was derived from six patients with histologically confirmed Crohn's disease, five patients with no evidence of inflammatory bowel disease, or was isotonic saline, or normal rabbit mesenteric lymph node tissue. Other animals were injected intraileally or i.v. with passage homogenates prepared from the cecum or regional lymph nodes of rabbits inoculated 12 to 36 wk previously with the Crohn's tissue filtrates. The rabbits inoculated with the Crohn's tissue homogenates failed to thrive, showing a significant reduction in weight 6, 12, and 14 wk after inoculation compared with the control-injected animals. Of the 19 rabbits receiving the Crohn's homogenates, mucosal ulcerations, ileal thickening, and abscess formation were seen in eight animals and granulomatous changes evolved in nine. No significant macroscopic abnormalities or granulomatous changes were present in any of the animals inoculated with normal ileum or colon homogenates. Successful first passage was achieved from 6 of 11 rabbits; ileal thickening and cecal skip lesions were seen in 5 of 11 rabbits injected with these passage homogenates. Positive microscopic changes were also observed in four rabbits and equivocal changes were seen in two others injected with these homogenates. The results indicate that the transmissible agent or agents responsible for the development of Crohn's disease must approximate the size of a virus or be capable of being deformed to pass through a 0.2-μ filter.

9395 THE VALUE OF COLONOSCOPY IN THE DIAGNOSIS OF CROHN'S DISEASE. *(E.)* Geboes, K.; Vantrappen, G. (Univ. Hosp. St. Rafael, Univ. Leuven, Leuven, Belgium). *Gastrointest. Endosc.* 22(1):18-23, 1975.

Fifty-nine patients with Crohn's disease were prospectively examined by colonoscopy and biopsy with a view to etablishing endoscopic, radiographic, and histologic correlations. In 73% of the patients the entire colon could be viewed and biopsied; no complications occurred in any of the patients. Colonoscopy enabled a histologic diagnosis to be made in 14 (24%) patients, based on the presence of typical sarcoid granulomas. In 10% of the patients this confirmed an earlier diagnosis, and in 14% the colonoscopic biopsy yielded the only histological evidence of the disease. Biopsy of micro-ulcerations most often yielded a definitive histologic diagnosis. Ten of the 16 biopsies in micro-ulcerations contained typical granulomas; eight of the 14 diagnostic biopsies were taken from such lesions. Granulomas were also found around the edge of macro-ulcerations in eight of 72 specimens. Biopsies from other lesions seldom yielded more than nonspecific inflammatory reaction. Endoscopically normal mucosa showed nonspecific inflammatory reactions in 40% of biopsy specimens. Colonoscopy proved superior to radiology in defining mucosal abnormalities such as ulcerations and nodular or polypoid lesions and for recognizing the segmental character of colonic lesions. Haustral changes and diminished distensibility were better appreciated radiologically, particularly in the right colon. Although radiography and proctosigmoidoscopy remain valuable diagnostic tools, this study demonstrates the extent to which colonoscopy can be used in evaluating patients with Crohn's disease.

9396 RESULTS OF SURGERY FOR CROHN'S DISEASE IN THE GLASGOW REGION, 1961-70. *(E.)* Young, S.; Smith, I. S.; O'Connor, J.; Bell, J. R.; Gillespie, G. (Stobhill General Hosp., Glasgow, Scotland). *Br. J. Surg.* 62(7):528-534, 1975.

Surgical management of regional enteritis in the Glasgow region was studied with particular reference to mortality, morbidity and the posibility of recurrence. The study group included 283 patients with a clinical radiological and histological diagnosis of regional enteritis. These included 155 with involvement in the small intestine alone, 81 with ileocolitis, and 47 with large intestinal involvement alone. Indications for initial surgery included: obstruction (27%); fistula (9%); severe alimentary symptoms (44%); suspected appendicitis (11%); and failed medical treatment (9%). Of the 175 patients with recurrence, indications for subsequent admission included: obstruction (23%);

fistula (23%); alimentary symptoms (44%); abscess (4%); and anemia combined with weight loss (6%). Resection was followed by an overall recurrence rate of 33%, but in patients with large intestinal disease alone, the recurrence was 18%. Laparotomy, biopsy and bypass procedures were followed by a recurrence rate of 70%. Postoperative complications occurred as perforation in four patients and fistula formation in 30 (11%); anastomotic leakage occurred in ten patients. There were 21 postoperative deaths in the entire series, and later, seven additional related and ten unrelated deaths. At the end of the study period, 47% of the patients had disease confined to the small intestine, 39% had ileocolitis, and 13% had large intestinal disease alone. It is suggested that the timing of operation, rather than the feasibility of surgery, be evaluated.

9397 ILEORECTAL ANASTOMOSIS FOR CROHN'S DISEASE OF THE COLON. *(Eng.)* Lefton, H. B.; Farmer, R. G.; Fazio, V. (Cleveland Clinic Foundation, 9500 Euclid Ave., Cleveland, Ohio 44106). *Gastroenterology* 69(3):612-617, 1975.

The postoperative course of 35 women and 31 men (mean age 29.2 yr) who underwent ileorectal anastomosis for Crohn's disease at the Cleveland Clinic between 1957 and 1972 was evaluated. The average follow-up was six yr. Twenty-six patients showed an excellent clinical response to surgery with no evidence of recurrent disease. The lack of recurrence was confirmed by sigmoidoscopy and roentgenography. Some patients in this group were receiving no medication, while others received occasional symptomatic treatment for diarrhea and/or prophylactic adrenocorticotropic hormone. A total of 12 patients showed a satisfactory clinical response to surgery. These patients showed a mild to moderate recurrence of symptoms such as rectal bleeding, increased number of daily bowel movements, and abdominal pain; the symptoms responded to adrenocorticotropic hormone or steroids. There were no signs of small intestinal involvement and none of the patients required additional surgery. Twenty-one patients required either revision of their anastomosis or ileostomy after their initial operation. These patients suffered abdominal pain, diarrhea, and rectal bleeding which could not be controlled by therapy. The disease recurred within an average of 3.5 yr; the most common procedure performed for these patients was a loop-end ileostomy with excision of the rectal segment. Presently, 17 of these patients have ileostomies and four have functioning ileorectal anastomoses. Seven patients with diversionary ileostomies and ileorectal anastomoses never had their ileostomies closed; no anastomotic leaks developed. Preoperative rectal hyperemia was present in eight patients, toxic megacolon developed in 11 cases, and nine patients had internal or perianal fistulae during the course of their illness. Five patients died, all from causes not directly related to the ileorectal anastomosis. The amount of ileal resection, providing it was less than 50 cm, had no apparent effect on the prognosis for ileorectal anastomosis, and steroid or adrenocorticotropin therapy had no apparent long range influence. The best surgical results were achieved in the youngest patients. The data indicate that ileorectal anastomosis is a safe and useful procedure for selected patients with Crohn's colitis.

9398 HUMORAL IMMUNE SYSTEM ACTIVITY IN INFLAMMATORY BOWEL DISEASE. *(E.)* Teisberg, P.; Gjone, E. (Univ. Hosp., Rikshospitalet, Oslo 1, Norway). *Scand. J. Gastroenterol.* 10(5):545-549, 1975.

The metabolism of complement components in inflammatory bowel disease was studied. Twenty-five patients with ulcerative colitis and 29 patients with Crohn's disease were diagnosed and evaluated. Venous blood samples were drawn from the 54 patients, while 50 blood samples from 30 healthy individuals served as controls. Activation products of C3 were demonstrated by crossed immunoelectrophoresis in agarose gel; complement components C4, GBG, and C3 were determined by the radial immunodiffusion method. *In vivo* activation was demonstrated in 56% of the patients with ulcerative colitis; the GAG fragment, formed as an activation product of GBG, was found in 78.5% of those patients, plus one of the others. Complement system involvement was positively correlated with disease activity and extent of intestinal involvement: 51% of the patients with Crohn's disease had circulating activation products of C3, while 60% of those also had GAG. The presence of these activation products again correlated with activity of the disease, but not with extent of affected bowel area. In eight patients, serial studies performed on two to four blood samples collected over a two-yr period confirmed the conclusion. In view of the similar complement findings of ulcerative colitis and Crohn's disease, complement activation seems a pathogenic factor in Crohn's disease, or it may reflect heterogeneity in the mechanisms of tissue injury in ulcerative colitis. The normal serum levels of C4, GBG, and C3 found suggest increased synthesis compensating for a high catabolic rate of C3 and GBG.

9399 FECAL RADIOIODIDE EXCRETION FOLLOWING INTRAVENOUS INJECTION OF ^{131}I-ALBUMIN AND ^{125}I-IMMUNOGLOBULIN G IN CHRONIC INFLAMMATORY BOWEL DISEASE. AN AID TO TOPOGRAPHIC DIAGNOSIS. *(E.)* Jarnum, S.; Jensen, K. B. (Rigshospitalet, Blegdamsvej 9, 2100 Copenhagen, Demark). *Gastroenterology* 68(6):1433-1444, 1975.

Radiographic abnormalities were studied in 27 patients with regional enteritis and 21 with ulcerative colitis. Albumin turnover was measured after i.v. injection of ^{131}I-labeled human serum albumin (30-50 µCi); immunoglobulin G (IgG) studies utilized ^{125}I-labeled IgG (10-20 µCi). Intestinal protein loss was also determined by administration of ^{59}Fe-iron dextran simultaneously with the albumin and IgG. A highly significant correlation was found between fecal iron clearance and the fractional catabolic rate of albumin in patients with ulcerative colitis. Serum albumin was negatively correlated with the fractional catabolic rate of albumin, and the latter was highly and positively correlated with the fractional catabolic rate of IgG. There was a marked correlation between fecal

iodide excretion from labeled albumin and fecal iodide excretion from labeled IgG. Fecal excretion of both ^{131}I and ^{125}I was positively correlated with fecal iron clearance. In patients with regional enteritis, there was a high correlation between fecal iron clearance and the fractional catabolic rate of albumin. There was no correlation between serum albumin and the fractional catabolic rate of albumin. However, the latter was significantly correlated with the fractional catabolic rate of IgG. Radioiodide excretion from both labeled albumin and IgG was highly correlated. Fecal iodide excretion from labeled IgG exceeded that of iodide excretion from labeled albumin in patients with small intestinal lesions. There was a positive and significant correlation between diarrhea and fecal iodide excretion in both ulcerative colitis and regional enteritis, but there was no correlation between fecal mass and intestinal protein loss. It is suggested that simultaneous studies with radioiodine-labeled albumin and IgG in protein-losing chronic inflammatory bowel disease may be useful in identifying the site of the lesion in cases where radiography shows no lesions or lesions of a doubtful nature.

9400 SERUM IMMUNOGLOBULIN M CONCENTRATIONS FOLLOWING BOWEL RESECTION IN CHRONIC INFLAMMATORY BOWEL DISEASE. *(E.)* Soltis, R. D.; Wilson, I. D. (Univ. Minnesota Medical Sch., Minneapolis, Minn. 55455). *Gastroenterology* 69(4): 885-892, 1975.

The nature of immunoglobulin changes occurring after surgery was investigated in chronic inflammatory bowel disease (CIBD) patients undergoing bowel resections and in controls undergoing various other intra-abdominal operations. Serum was obtained before surgery and at varying postoperative intervals from 20 patients with CIBD and from 11 control subjects. Immunoglobulins A, G, and M were quantitated by immunodiffusion in agar gel. IgM was isolated by Sephadex gel filtration and subsequently purified by immunoadsorption with glutaraldehyde-treated anti-IgM. Total serum proteins, serum protein electrophoresis, and sucrose density gradient ultracentrifugation of IgM were performed using standard techniques. Serum IgM concentrations increased significantly, by as much as 935%, between postoperative days 8 to 15 in both CIBD patients and controls; the increases were significantly higher in CIBD patients. While serum IgG and IgA concentrations decreased immediately after surgery in CIBD patients, serum IgA concentrations also rose slightly between days 8 to 15. All the serum IgM appeared confined to the 19 S fraction of the sucrose gradients. No relation between changes in serum IgM concentrations and anticolon antibody titers was found; further studies showed no difference in the binding of normal or chronic ulcerative colitis (CUC) IgM to the normal or CUC colon. In general, increased postoperative titers were also noted against *Escherichia coli* and *Bacteriodes fragilis*, against blood group antibodies A and B, and against heterophil antibodies. No correlation of IgM concentrations with transfusions, operative time, type of anesthetic, or corticosteroid treatment was found. In contrast to prior observations, the studies demonstrate a later and nonspecific rise in serum IgM concentrations following surgery.

9401 CORRELATION BETWEEN REGIONAL ENTEROCOLITIS AND CUTANEOUS POLYARTERITIS NODOSA: TWO CASE REPORTS AND REVIEW OF THE LITERATURE. *(E.)* Solley, G. O.; Winkelmann, R. K.; Rovelstad, R. A. (Mayo Clinic, 200 First St., S.W., Rochester, Minn. 55901). *Gastroenterology* 69(1):235-239, 1975.

Case reports are presented for two women with regional enteritis and cutaneous polyarteritis nodosa. Surgery in the first patient at age 20 revealed regional ileitis and perforation of the ileum, and she was treated with salicylazosulfapyridine. S.c. nodules first appeared less than 1 yr later on the ankles, and prednisone therapy did not alter the course of the disease. Livedo reticularis and s.c. nodules were noted on both ankles and thighs on admission 1 yr later. Laboratory studies showed iron deficiency anemia, and moderate elevation of serum immunoglobulin (Ig) A and G levels. Skin biopsy showed a panarteritis involving all layers of the blood vessel walls of the large muscular vessels in the s.c. tissue. Treatment with sulfapyridine produced complete remission of the skin lesions. Recurrence over a 2-yr period indicated surgery. A portion of the terminal ileum, the cecum, a portion of the ascending colon and a segment of the sigmoid colon were resected. Improvement of the skin lesions was noted postoperatively. At 46 yr of age, the second patient developed s.c. nodules on the ankles and on the front of her legs. Less than 2 yr later, regional enteritis was diagnosed, with secondary skin lesions, but right hemicolectomy with resection of the terminal ileum failed to improve the skin disease. A nearly symmetrical, tender, papulonodular skin eruption with scarring and livedo reticularis was seen 2 yr after this. Treatment with sulfapyridine induced marked improvement by the end of 5 months. It is concluded that cutaneous polyarteritis nodosa is occasionally manifested in the spectrum of skin disorders of regional enterocolitis.

9402 ANKYLOSING SPONDYLITIS AND REGIONAL ENTERITIS. *(E.)* Mueller, C. E.; Seeger, J. F.; Martel, W. (Univ. Michigan Medical Center, Ann Arbor, Mich.). *Radiology* 112(3):579-581, 1974.

A retrospective review of the radiographs of 200 randomly selected cases of regional enteritis or granulomatous enterocolitis seen at a particular hospital between 1955 and 1971 was undertaken to determine the incidence of sacroiliac arthritis and ankylosing spondylitis. Unequivocally abnormal joints were found in ten men and ten women, six of whom (3 men and 3 women) had a clinical diagnosis of ankylosing spondylitis. Fourteen of the 20 patients were aged 20 to 40 yr, the remaining six being in the 40- to 60-yr age group. The colon was involved in only two cases, but became involved following small bowel surgery in four others; none of the group with overt ankylosing spondylitis had

colonic involvement, although two had surgical and histologic verification of bowel disease. The median duration of bowel disease prior to the earliest radiographic demonstration of sacroiliac arthritis was slightly less than five yr. Back symptoms preceded recognition of bowel disease in all but one of the six cases of clinical ankylosing spondylitis. One patient with a 16-yr history of psoriasis also had migratory arthralgias in the large joints and arthritis of the hands; five other patients had peripheral joint symptoms. None of the patients had a history of Reiter's disease or uveitis. The data show no correlation between spondylitis and involvement of the colon by regional enteritis. The prevalence of ankylosing spondylitis in patients with regional enteritis is comparable to that seen in patients with chronic ulcerative colitis. Radiologists should be aware of the association and should specifically look for evidence of spondylitis in patients with either of these diseases.

9403 A CONTROLLED EVALUATION OF INTRAVENOUS ADRENOCORTICOTROPIC HORMONE AND HYDROCORTISONE IN THE TREATMENT OF ACUTE COLITIS. *(E.)* Kaplan, H. P.; Portnoy, B.; Binder, H. J.; Amatruda, T.; Spiro, H. (Dept. Internal Medicine, Yale Univ., New Haven, Conn., 06510). *Gastroenterology* 69(1):91-95, 1975.

A prospective double-blind clinical trial was undertaken in patients with regional enteritis or ulcerative colitis to compare the therapeutic effects of hydrocortisone and adrenocorticotropic hormone (ACTH) in pharmacologically equivalent doses. Steroid therapy was warranted in all patients. Both hydrocortisone (300 mg) and ACTH (40 U) were administered by continuous 8-hr i.v. infusion. Of the 22 patients with acute colitis, seven were receiving steroids at the time of entry into the study. Severe disease was present in 18, and four had moderate disease; 15 of 22 improved with therapy. There was no significant difference in improvement between the ACTH- (57%) and hydrocortisone-treated (73%) groups. Mean plasma cortisol concentration for the ACTH-treated group was 80 mg/100 ml, compared to 123 mg/100 ml for the hydrocortisone-treated group. No difference was observed between those patients who responded to therapy and those who did not. Prior treatment with steroids did not prevent adrenal response to ACTH. The mean urinary excretion of 17-hydroxycorticoid was 35.1 mg/g of creatinine in those who responded to ACTH, in contrast to 59.9 mg/g in those who did not respond. Similar results were obtained in the group treated with hydrocortisone. ACTH produced a two- to four-fold higher 17-ketosteroid excretion than hydrocortisone. There was no significant difference in delay in onset of clinical improvement between the two groups. It is concluded that both drugs administered i.v. are equally effective in treating acute colitis in previously untreated patients, and that response to ACTH is rapid and there is no significant therapeutic lag or lag in plasma cortisol levels. Further, therapeutic response or failure cannot be related to differences in systemic steroid levels, and prior treatment with steroids may indicate hydrocortisone rather than ACTH treatment.

9404 COLONOSCOPIC MUCOSAL BIOPSIES IN CHRONIC INFLAMMATORY BOWEL DISEASE (CIBD): SPECIFICITY OF PATHOLOGIC DIAGNOSIS [abstract]. *(E.)* Hogan, W. J.; Hensley, G. T.; Miller, W. N.; Geneen, J. E. (Med. Coll. Wisconsin, Milwaukee, Wis.). *Gastroenterology* 68(4):1031, 1975.

9405 CELL-MEDIATED IMMUNITY IN CROHN'S DISEASE [abstract]. *(E.)* Meuwissen, S. G. M.; Schellekens, P. T. A.; Huismans, L.; Huis, B.; deWilde, F. A.; Swelm-Langeveld, J. B.; Tytgat, G. N. (Dept. Gastroenterol., Univ. Amsterdam, Amsterdam, Holland). *Gastroenterology* 68(4):954, 1975.

9406 ENDOSCOPIC FEATURES OF CROHN'S DISEASE OF THE STOMACH AND DUODENUM [abstract]. *(E.)* Danzi, J. T.; Farmer, R. G.; Sullivan, B. H.; Rankin, G. B. (Cleveland Clin. Found., Cleveland, Ohio). *Gastroenterology* 68(4):1024, 1975.

9407 SERUM LYSOZYME IN THE DIAGNOSIS AND FOLLOW-UP OF PATIENTS WITH CROHN'S DISEASE [abstract]. *(E.)* Falchuk, K. R.; Perrotto, J. L. (Massachusetts Gen. Hosp., Boston, Mass.). *Gastroenterology* 68(4):890, 1975.

9408 OBSERVATIONS ON THE TRANSMISSIBILITY OF CROHN'S DISEASE AND ULCERATIVE COLITIS [abstract]. *(E.)* Cave, D. R.; Mitchell, D. N.; Brooke, B. N. (St. George's Hosp., London, England). *Gut* 16(5):401, 1975.

9409 STUDIES OF A VIRAL AGENT ISOLATED FROM PATIENTS WITH CROHN'S DISEASE AND OTHER INTESTINAL DISORDERS [abstract]. *(E.)* Beeken, W. L.; Acharya Goswami, K. K.; Mitchell, D. N. (Brompton Hosp., London, England). *Gut* 16(5):401, 1975.

9410 ALTERNATE COMPLEMENT PATHWAY ACTIVATION IN INFLAMMATORY BOWEL DISEASE (IBD) [abstract]. *(E.)* Feinstein, P.; Kaplan, S. R.; Thayer, W. R. (Div. Biol. and Med. Sci., Brown Univ., Providence, R.I.). *Gastroenterology* 68(4):1089, 1975.

9411 QUANTITATIVE ANALYSIS OF SKELETAL GROWTH, DEMINERALIZATION AND VITAMIN D STATUS IN PATIENTS WITH INFLAMMATORY BOWEL DISEASE [abstract]. *(E.)* Wagonfeld, J. B.; Genant, H. K.; Mall, J. C.; Bolt, M.; Vander Horst, J.; Rosenberg, I. H. (Dept. Med. and Radiol., Univ. Chicago, Chicago, Ill.). *Gastroenterology* 68(4):1065, 1975.

9412 THE DIAGNOSTIC ACCURACY OF COLONOSCOPY VERSUS RADIOGRAPHIC STUDY IN INFLAMMATORY BOWEL DISEASE: A CONTROLLED STUDY [abstract]. *(E.)* Present, D. H.; Waye, J. D.; Khilnani, M. T. (Mt. Sinai Sch. Med., New York, N. Y.). *Gastroenterology* 68(4):1061, 1975.

9413 OBSERVATIONS ON THE TRANSMISSIBILITY OF CROHN'S DISEASE AND ULCERATIVE COLITIS [abstract]. *(E.)* Cave, D. R.; Mitchell, D. N.; Brooke, B. N. (St. George's Hosp., London, England). *Gastroenterology* 68(4):871, 1975.

9414 ENDOSCOPIC DIAGNOSIS OF CROHNS DISEASE OF THE STOMACH [abstract]. *(E.)* Iswara, K.; Kodsi, B.; Wickremesinghe, P. C. (Maimonides Med. Cent., Brooklyn, N. Y.). *Gastroenterology* 68(4):1032, 1975.

See also, 8020, 8041, 8752, 8804, 8809, 9004, 9319, 9334.

NUMBERS FOLLOWED BY AN ASTERISK INDICATE ABSTRACTS. OTHER NUMBERS REFER TO CITATIONS.

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